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What's Wrong With the Railroad Shops?

Underlying causes of present railroad shop troubles—What may be done to remedy shortcomings of methods, equipment and personnel

WHY ARE THERE such wide differences between the railroad shop and the average machine shop and so many of them? What is the underlying cause? As a rule it is difficult to say with any degree of certainty what the underlying cause of any condition is but in this particular case it seems that a fairly good guess can be made.

In the first place railroads as a whole and the shops in particular suffer from what might be called inbreeding, the lack of new blood. The average master mechanic or superintendent of a shop has grown up in that particular shop or else in this railroad or at the very best with some railroad. The cases where one may find a superintendent who has come from some other industry are exceedingly rare. We realize that many years with one industry produce a certain amount of detailed knowledge which is of advantage but at the same time a young man starting in an industry and staying with this industry until his hair has grayed is no longer capable of seeing things in their true perspective unless he has been a wide reader and a careful student. He will measure everything on the scale of his industry. He will come to believe that everything must be as it is because its present state represents his own development and it is very difficult for a man to believe that he has developed in the wrong direction.

The more sincere and earnest a man is in his work the more strongly he will believe that what he is doing is right unless his experience has broadened him sufficiently to see that though his intentions may be right his methods may be wrong. Such broadness of experience does not come to a man who spends the greater part of his life in one place, uses only one method and system and applies it to one product only.

Not only do the superintendents, master mechanics and foremen suffer from this lack of broadening experience and make the shop suffer in its turn but the men themselves are restricted by what is called the priority system of promotion. The priority system has other disadvantages besides its tendency toward inbreeding. It causes a large portion of the shop to be somewhat disorganized every time a man leaves, dies or is promoted to a different kind of position.

Under the rules, as soon as a job becomes vacant every man in the shop has the right to bid for it and the oldest man in service of those who bid will get it. To illustrate this let us carry the system to a ridiculously improbable but logically possible extreme. Let us imagine a shop with 100 men of which No. 1, the man with the largest number of years of service, has been promoted or leaves the shop for some other reason. The 99 remaining men now bid for his job and No. 2 gets it. The remaining men now bid for the job of No. 2 and No. 3 will get this job and so on. There will be 99 shifts and one new employee. If these 99 men have been fairly efficient at the tasks at which they worked they will all be suddenly less efficient. Quite often it will be found that No. 3 or No. 4 is not fitted for his new job but only after the disturbance has been settled. It will then be necessary to replace him causing the possibility of 96 more changes.

Even a small fraction of the disturbance which might

IN THIS article which concludes the series based on our investigation of railroad repair shops we have attempted to point out underlying causes for the difficulties observed and to suggest remedies. We have tried to avoid blaming anybody as that is not our function. Here are the constructive suggestions we have to offer:

Make it possible for mechanical executives to visit periodically machine shops other than railroad shops.

Pay salaries high enough to stimulate the shop executives to greater efforts and to attract good men from other kinds of shops.

Eliminate the priority promotion system for the men in the shop and substitute the merit system.

Standardize rolling stock, parts and shop equipment.

Separate repair and production work and employ production engineers.

Overhaul machinery and tool equipment and get rid of the obsolete and inadequate.

be caused in this extreme case will be sufficient to prevent continuity of conditions and will keep the men from becoming highly efficient in their work. Where such rules do not prevail the manager or foreman selects the man who in his opinion is best fitted for the vacant job and replaces him with a new man or with one of the older men particularly fitted for the position. There will then be promotion along logical lines in that the best man for the job is selected. At the same time it will be possible to get new men of ability because it is not necessary to put them at the bottom of the list as must be done in the railroad shop when the priority rule is followed.

It may be said that the railroad managements are not to blame for this condition; that the rule is made *for* but not *by* them. However, as we pointed out before, we have no desire to place the blame on any person or persons; we merely wish to point out bad conditions as we see them regardless of who is to blame.

How to Remedy Inbreeding Trouble

The remedy for the first item mentioned in this article, the inbreeding of foremen and executives would seem to be obvious. The fact that the men have been for a long time in one place and are familiar with its conditions causes no trouble. It is the fact that they have not been in any other place which makes them less efficient. It should, therefore, be made a rule that every foreman and every executive shall see some of the industry outside of the railroad shop at stated intervals. And it should be kept in mind that what these men ought to see is not some other railroad shop but some industry which is in most respects different from the one in which they are engaged.

The foreman who sees how a piece of work is done in some other railroad shop may profit by this experience but he is more likely to try to find reasons and arguments to prove to himself if not to others that his own method is the better. If on the other hand he visits shops where things are done with which he is not competing he will be in the proper frame of mind to appreciate what he sees and apply new principles to his own work. Besides, it will be a refreshing thing to him to see shops and operations which are completely different from the ones with which he is familiar.

In addition an attempt should be made to attract able men from other industries and put them in charge of some of the work in the railroad shops. Here we come in contact with a new difficulty. The salaries paid by railroads to their shop executives are as a rule much below those paid to men in corresponding positions in other industries. Consequently, it is not possible to attract such men and inbreeding becomes a necessity. Low salaries are merely one phase of a condition which has long been recognized by everyone familiar with railroad shops; namely, that the railroad managements grudgingly provide the necessary means for the conduct of their shops. The fact that at the present time the railroads themselves are on starvation diet does not explain this matter because the condition was exactly the same in former years when railroads were wealthy and prosperous. It would seem to us that the railroad managements must show a change of heart, must turn over a new leaf and must realize that their shops are as much an essential part of the productive equipment of a railroad as locomotives, cars and tracks.

It is not so easy to point out how the priority system may be abolished. We can only say that we consider this system to be the worst one which could be devised to get efficient men. Whether it can be abolished by the railroads themselves or whether they will have to depend on governmental action makes no difference. The first step to take is to bring out the facts and the reason why this system is to be condemned. It may be taken for granted that our Government is not entirely deaf to clean cut arguments supported by a sufficient array of facts. The railroads should collect such facts and have the arguments drawn up and published from time to time, making the entire affair a matter of education or, if one wishes, of propaganda. The facts should be true and the arguments sincere so that no one can say that this propaganda is based on lies. We believe that such a campaign will go far toward producing the desired results.

Any factory is confronted with two problems: to make things economically and to get them out on time. In most factories the getting out on time though of great importance is not such an absolute necessity that it does not permit of compromise. There is generally the possibility of shifting dates somewhat. To drop economy for the sake of gaining an extra day would be suicidal in most cases. Economy must be maintained or profits will dwindle and the industry will break up. In the railroad shop the date when an engine or a car must go into service again does not permit of compromise. It is all important and economy becomes a secondary consideration.

This fact seems to have blinded the eyes of railroad shop managers to the importance of economy even though it is not the first consideration, and as a result economical methods in the railroad shops are rather few and far between. Perhaps it would be too much to expect that one man can put his full energy to the tasks of getting production out on a given date and doing it economically as well. We recommend, therefore, that these two functions be separated in the railroad shop and that there be a man responsible for economy of production only, with the understanding, however, that the head of the shop shall have the right to over-ride such a man in case economy interferes with expedience. Such cases would necessarily be rare and when they did occur the head of the shop would be entirely responsible for the lack of economical results.

Need for Production Engineers

Putting the foregoing in a few words, we would say that there should be a production engineer in every railroad shop, or at least on every system. This man should be one thoroughly versed in mechanical methods of production, in standardization methods, etc. In other words, a first-class industrial engineer. To be perfectly clear, let us say at once that we have reference not so much to a man who can introduce a system of control as to the man who can introduce machining and handling methods which will produce the best and most economical results.

It will probably be difficult to find many such men among the forces now employed by the railroads. There has been so little opportunity for railroad men to develop along such lines that it can hardly be expected that they may be found at the present time. It may, therefore, be necessary to seek such men on the outside, to call in men who are well known and equipped to improve the physical conditions of the shops and

who are familiar with the best methods now in use in other industries.

Though such men would be capable of introducing standard methods, standard equipment and standard operations yet they would not be in a position to standardize also the parts that go into locomotives or cars. Such standardization should be brought about by the executives of the railroads themselves and preferably in co-operation with those of other systems.

Standardization of Equipment

In some respects standardization of equipment is an easy task because the first thing that should be done is to cut out all arbitrary specifications and requirements unless he who specifies can show that nothing else will do except the thing he has asked for. To have an infinite variety of constructions of freight cars of the same capacity and the same track gage is absurd. We find that the makers of freight cars are constantly confronted with new designs differing only in unimportant details but requiring an enormous outlay of money and time for the production of new tools, patterns, gages, expensive dies, etc.

All these fancy requirements should be done away with at once. Then an attempt should be made at standardizing parts and dimensions of parts, so that it would be possible to keep some parts in stock and be assured that other parts, if properly made, would fit them.

That such standardization of parts is entirely possible and economically justified is shown by the locomotive repair work now being done in the shops of Henry Ford's D. T. & I. R.R. In several articles soon to be published we shall describe in detail the work of the Ford engineers in standardizing locomotive cabs, runing boards, pilots, etc. Spring breakage has been eliminated through the use of automotive specification steel and greatly increased life of side rods, main rods and crankpins has resulted from the use of vanadium alloy steel in their construction.

Mechanical achievements which have been but rosy dreams to railroad shop executives are actual accomplishments on the D. T. & I.

Reconciling Differences Between Purchasing and Mechanical Departments

The question as to how far the authority of the purchasing department should go has been discussed many times and is always an important one in the conduct of any kind of business. The shop has certain requirements which should be met but on the other hand it often makes demands which are not based on anything substantial. A careful survey should be made of all the shop requisitions and the purchasing agent is the man who is supposed to do this. In our opinion it is not a question as to whether a shop requisition should be carefully scanned and perhaps curtailed but whether the purchasing agent is the proper party to do so.

In well organized manufacturing shops there is a department which stands between these two, the engineering department. This department should have the power to pass on the requisitions of the shop so far as new equipment, tools, nature of material and various other things are concerned and should pass the requisitions, with its O. K., on to the purchasing agent who, in his turn, should be charged merely with the procurement of whatever is required and at the best possible terms.

In most railroad shops this arrangement is wanting and where it exists it will often be found that the purchasing agent has the power to over-ride the decision of the engineering department. This is entirely wrong because the purchasing department has no means of finding out whether requisitions are based on the proper consideration or not.

Another thing which should be done, and we are glad to say is being done on some of the railroad systems, is to divorce repairs from manufacture. By this we do not mean exactly that no manufacturing should take place in the same shop in which repairs are being handled but that it should be done under separate supervision so that repairs shall not be delayed for the sake of economizing on manufacture nor shall the manufacture of standard parts suffer because there is a hurry job at the repair end. It is preferable to have these two departments completely separate as to buildings, equipment and organization, but it is not always possible or even advisable to have a complete plant for a rather limited amount of manufacturing. It may be good policy in many cases to have the manufacturing department located in the same building used for the repair shop but with its own equipment and its own organization.

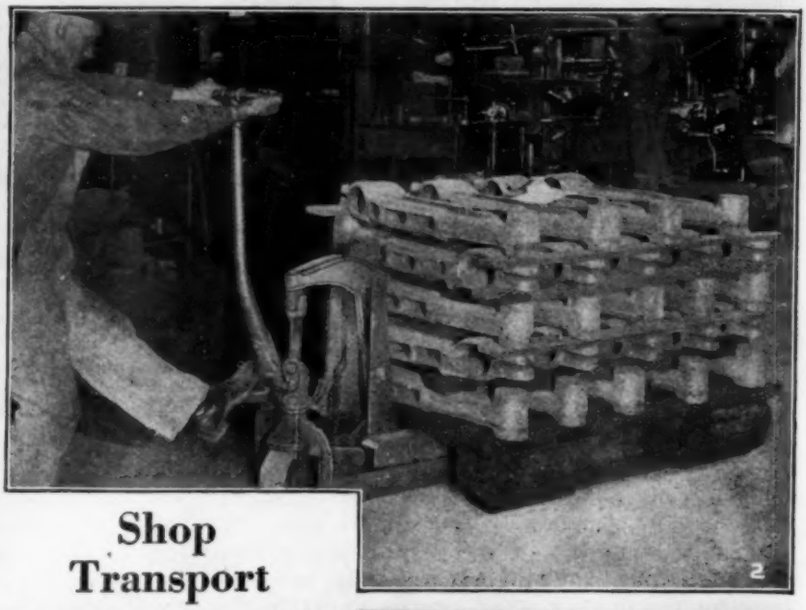
Better Machinery and Tools Essential

Finally, and this is perhaps the most important point at the present time, an attempt should be made at once to improve the equipment of machinery and tools. Such a large portion of the present equipment is out of date, unfit, battered, ill-adjusted and generally speaking more or less useless for its purpose that a comprehensive survey should be made in each shop as to the condition and productivity of the machines now in use. Though it may not be possible under the present financial condition of the railroads to throw out all this old equipment, yet it is of prime importance that the management of the railroad should know in what condition the shop is so that whatever improvement may be made now or in the near future shall be based on exact knowledge of existing conditions.

The attempts at improving equipment in former years have been made in spots only. The latest and most up-to-date machine may be found standing side by side with another machine, the equal of which cannot be found anywhere in the United States of America simply because such machines have not been built for generations past. It is this uneven, spotty condition of the machine tool equipment which holds down the production of the few good machines that may be found.

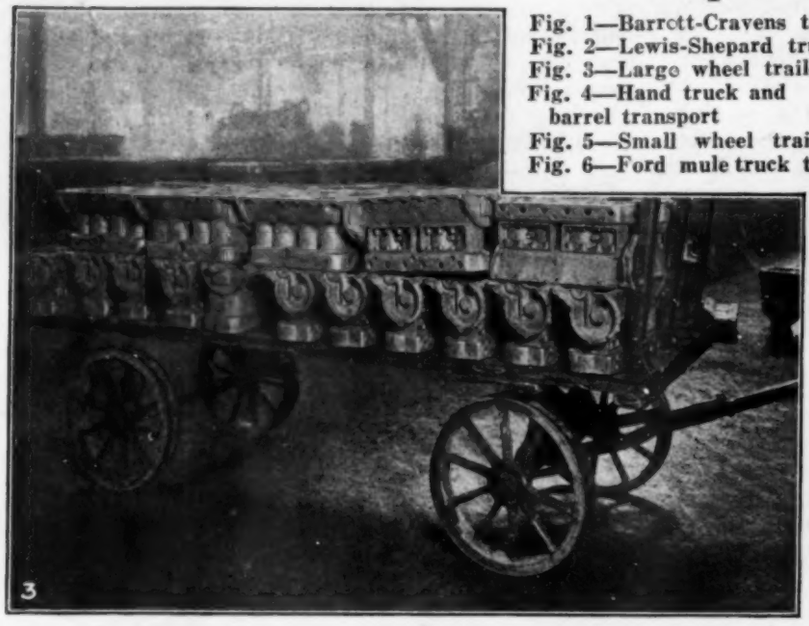
There should be an attempt at making the tooling proportional to the machines on which the tools are used. There is little merit in spending a great deal of money for an up-to-date machine unless the tools used on it permit that machine to work to its full capacity. Neither is there any sense in buying the highest grades of tools for machines which cannot use them to more than a fraction of their total capacity. Above all, instructions should be furnished for the proper maintenance of tools and machinery. An ill-sharpened tool of high quality is no better than a well-sharpened tool of lesser quality.

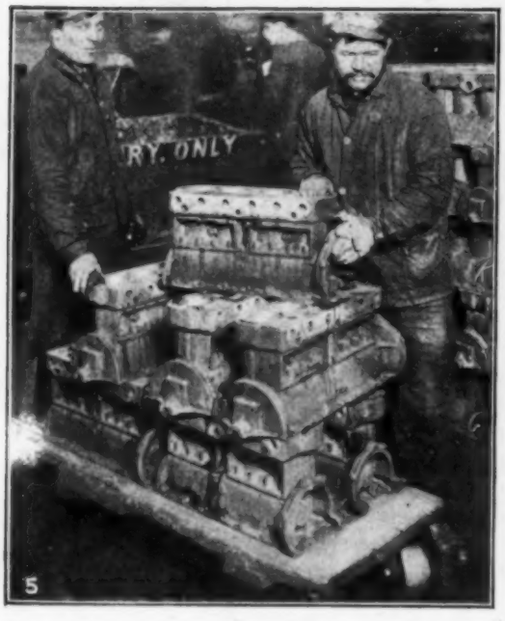
Most of the things stated here must sound like truisms and would be such for the average manufacturing plant. The fact that the railroad shops seem to be so completely out of touch with the progress made in other machine shops makes our remarks to the point.

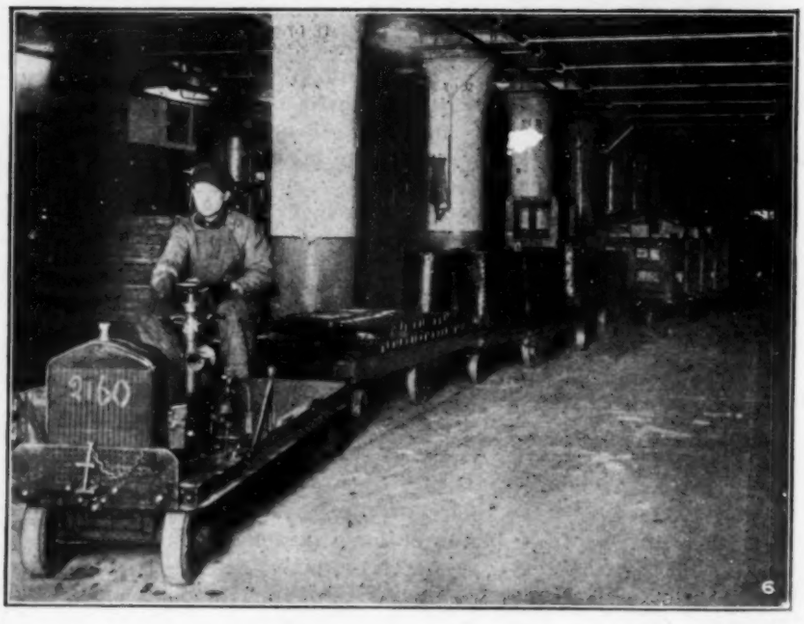


Shop Transport

Fig. 1—Barrett-Cravens truck
Fig. 2—Lewis-Shepard truck
Fig. 3—Large wheel trailer
Fig. 4—Hand truck and barrel transport
Fig. 5—Small wheel trailer
Fig. 6—Ford mule truck train







The Organization and Management of a Medium Sized Plant

By PERCY S. BROWN
Works Manager, The Corona Typewriter Co., Inc., Groton, N. Y.

General organization—Manufacturing—Tools and machines—Operation control—Research to secure standards—Planning control of materials—Records used for comparison and costs

THE CORONA Typewriter Co. manufactures only a portable typewriter, the case in which it is carried, and a few accessories such as folding stands and label holders. Since only one model is manufactured this paper deals with a specific type of manufacture: the continuous producing of Coronas and their cases. Our system of organization and methods of manufacturing control would in all probability be only slightly applicable in plants where there is a great variety of products manufactured.

We divide our manufacturing into two parts. First, we manufacture parts to finished parts stock, and second, we assemble machines from this stock. Our parts manufacturing departments are composed of machine departments, finishing departments, and a bench assembly department where parts are adjusted before being stocked, and other operations are performed which cannot be readily assigned to other departments. In addition we classify under parts manufacturing all inspection work performed on parts, as well as the tool room and wood shop.

Owing to the nature of our manufacturing problem we have been able to so route the flow of parts that it is with few exceptions continuous from the first to the fourth floor of our Groton plant, from there to our Cortland plant and back to the fourth floor of the Groton plant.

The entire organization from president down has been highly functionalized and the result has been increased individual and group efficiency. In this connection the following explanation of the functionalizing of factory departments may prove of interest. The organization chart, Fig. 1, corresponds with this outline:

The factory has to be properly heated, equipped with line

Abstract of paper presented before the Taylor Society, New York, Nov. 23, 1922.

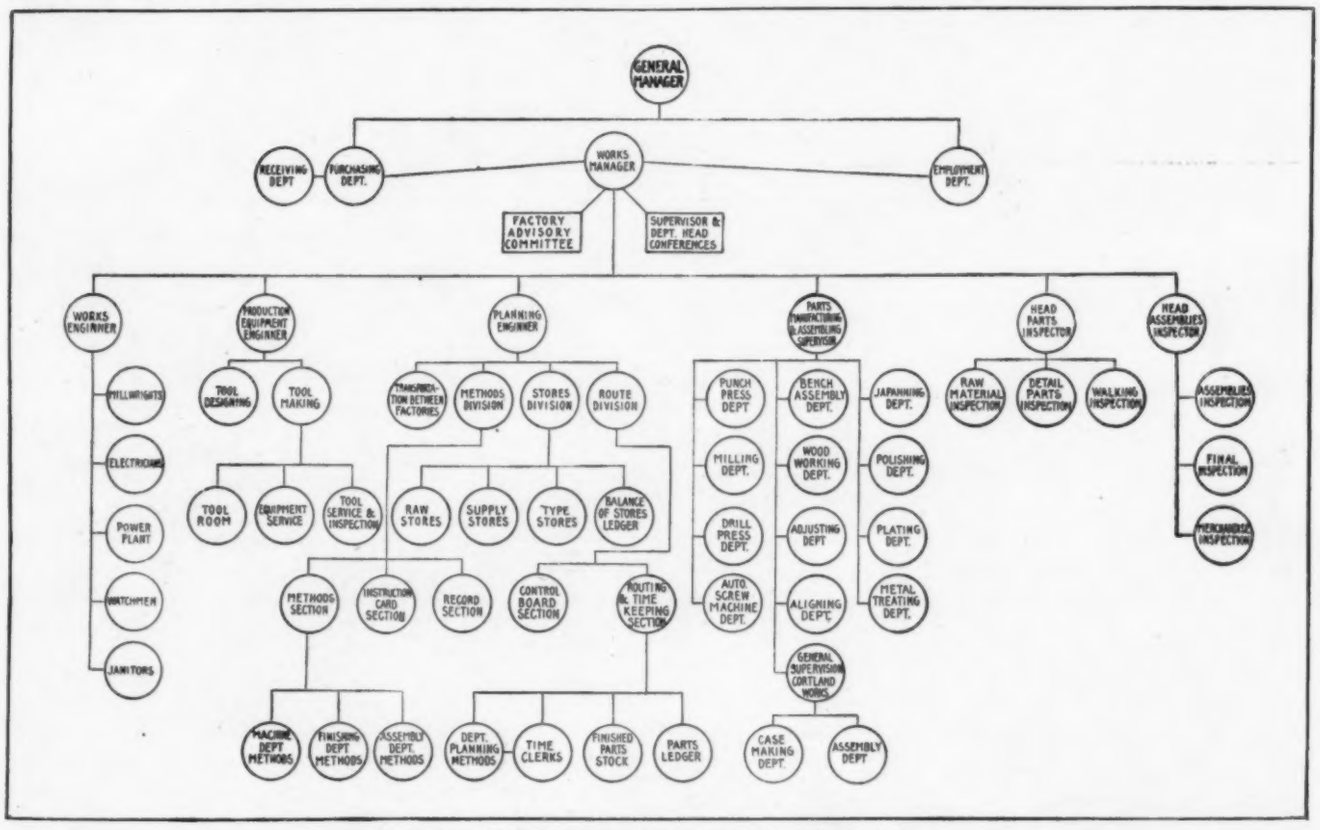


FIG. 1—MANUFACTURING ORGANIZATION CHART

shafts and pulleys, motors, power, etc. It must be properly inspected, watchmen provided, millwrights and electricians must be available, cleanliness maintained and adequate safeguards provided against accident to employees. The responsibility for this work is placed on the works engineer.

We must next provide the machinery and tools to perform manufacturing operations. These details are under the supervision of the production equipment engineer.

The material must be available in order to manufacture parts. It is secured by the purchasing department.

We must provide the men and women to operate the machines. This is a function of the employment department.

Now being ready for production we must utilize a planning and control division, which studies operators, sets rates, determines methods of manufacturing, establishes adequate control of stores, and a system of scheduling, routing, dispatching and time keeping on all operations. These are major functions of the planning engineer and his division heads.

Next we must provide skilled supervisors for each department and such supervisors must not only be thoroughly familiar with all manufacturing operations under their control but must also be competent instructors on all operations and close observers of quality. Each supervisor reports directly to the works manager, although his functions are dictated largely by the planning department.

Although we place primary responsibility for quality with the supervisor and secondary responsibility on the operator, we provide for both walking and detail inspection of parts as well as inspection of raw materials. We therefore have a head parts inspector.

Because of the great difference between parts inspection and assemblies inspection we have found it advisable to have a head assemblies inspector who is responsible for all assembling operations and the quality of the finished product. He also handles the inspection of such merchandise as we handle, as for example, special luggage of all kinds made for the Corona.

The works manager has as his consultants on factory matters two groups. The first is known as the factory advisory committee which consists of all heads of departments described above, except supervisors, together with the head of the service department, and the head of the experimental and designing department, both of which are under the general manager and only indirectly connected with the factory organization. The head of the methods division of the planning department is also a member of the committee. The committee considers and passes on all major factory problems and meets bimonthly and at any time on call of the works manager. At times there will be one meeting every two weeks and at other times there may be three or four.

The other advisory body is composed of all supervisors and all members of the factory advisory committee. These conferences are bimonthly and are open forums for the discussion of any topics of general interest. They also enable the management to present information on sales, costs, items of expense, publicity

INSTRUCTION CARD
FOR
MANUFACTURING ROUTINE, OPERATIONS AND INSPECTION

DATE ISSUED 4-3 19 20, 51 DEPT'S COPY PART NO. 2x1
NAME OF PART FRAME
EFFECTIVE ON ORDER NO. 4216 DATE CANCELLED 19

OP. NO.	OPER. NO.	FIXED TIME PER 100	VARIABLE TIME PER 100	DATE TIME ESTABLISHED	OPERATION NAME	RATE OF MACHINE RUNNING
1	1	.167	.247	5/9/20.	PIERCE APART.	
	2	.106	.157	5/9/20.	PIERCE ALL HOLES.	
	3	.117	.20	5/8/20.	FORM DIP IN FRONT.	
2	4	.63	1.17	9/3/21.	PROFILE TOP.	
	5	.20	.37	8/19/20.	MILL CORNER GROOVES.	

INSPECTION INSTRUCTIONS

OP. NO.	CLASS OF WORK	GAUGE USED	INSPECTION TO BE MADE	RATE OF INSPECTION ALLOWANCE
10			STOCK WHEN RECEIVED (INSPECT EACH STRIP)	
	B	677 711	GAUGE WIDTH AND THICKNESS. SEE THAT STOCK IS STRAIGHT AND NOT EXCESSIVELY MARRED OR PITTED.	
1	W		PIERCE ALL HOLES (SAMPLES) SEE THAT ALL HOLES ARE PIERCED. SEE THAT DIE DOES NOT MAR SURFACE.	
3	W	SCALE	FORM DIP IN FRONT (SAMPLES) SEE THAT FRONT HOLES DO NOT CLOSE. SEE THAT FRONT FOOT CAP RIVET HOLES DO NOT CLOSE SEE THAT EARS ARE CORRECTLY FORMED.	
2	W	1804	PROFILE TOP (SAMPLES) GAUGE DISTANCE FROM TOP OF PROFILE TO CORNER POST HOLE.	

IF OPERATIONS OR INSTRUCTIONS CAN NOT BE PERFORMED AS OUTLINED OR CHANGES ARE REQUIRED NOTIFY THE METHODS DIVISION OF THE PLANNING DEPARTMENT IMMEDIATELY.

FIG. 2—OPERATION ROUTINE CARD. FRONT AND BACK

STORES LEDGER
CORONA TYPEWRITER COMPANY, INC.

SYMBOL
SIZE GRADE LOCATION
KIND
USED FOR
WHEN AVAILABLE FALLS TO REQUISITION IN QUANTITIES OF PURCHASE TIME ALLOWANCE
WHEN TOTAL ON HAND FALLS TO ADVISE PURCHASING AGENT.

INSTRUCTIONS FOR POSTING
(a) When Purchase Requisition is written, add quantity ordered to 1-1A and 3.
(b) When quantity is received, subtract quantity received from 1A and add quantity accepted to 2, making any necessary adjustment in 3.
(c) When quantity is issued, subtract from 2 and 3.
Note—Balance in 3 should always equal sum of Balance on Order (1A) and Balance on Hand (2).

1 REQN'D, ORDERED, INVOICED, BAL. ON ORDER						1A	2 ACCEPTED ISSUED AND BALANCE ON HAND											3 AVAILABLE ON ORDER AND ON HAND				APPORTIONED		
DATE REQN'D	REQN. NO.	PUR. ORDER NO.	QUAN. ON EACH ORDER	DATE INV.	QUAN. INV.	BALANCE ON LEDGER	DATE REC'D	QUAN. ACCEPTED	DATE ISS'D	ISS'D FOR ORDER NO.	ISS'D FOR PART NO.	UNIT COST	QUAN. ISS'D	BALANCE ON HAND	VALUE OF QUANTITY ACCEPTED	VALUE OF QUANTITY ISSUED	VALUE OF BALANCE ON HAND	DATE	QUANTITY ORDERED	QUANTITY ISSUED	QUANTITY BALANCE	DATE	QUANTITY	ORDER NO.

FIG. 3—BALANCE OF STORES LEDGER

A—DAYS ALLOWED TO MANUFACTURE
B—PRODUCTION PER DAY
C—MINIMUM AMT FOR FINISHED STOCK
D— 19 +C

PARTS LEDGER
CORONA TYPEWRITER COMPANY, INC.

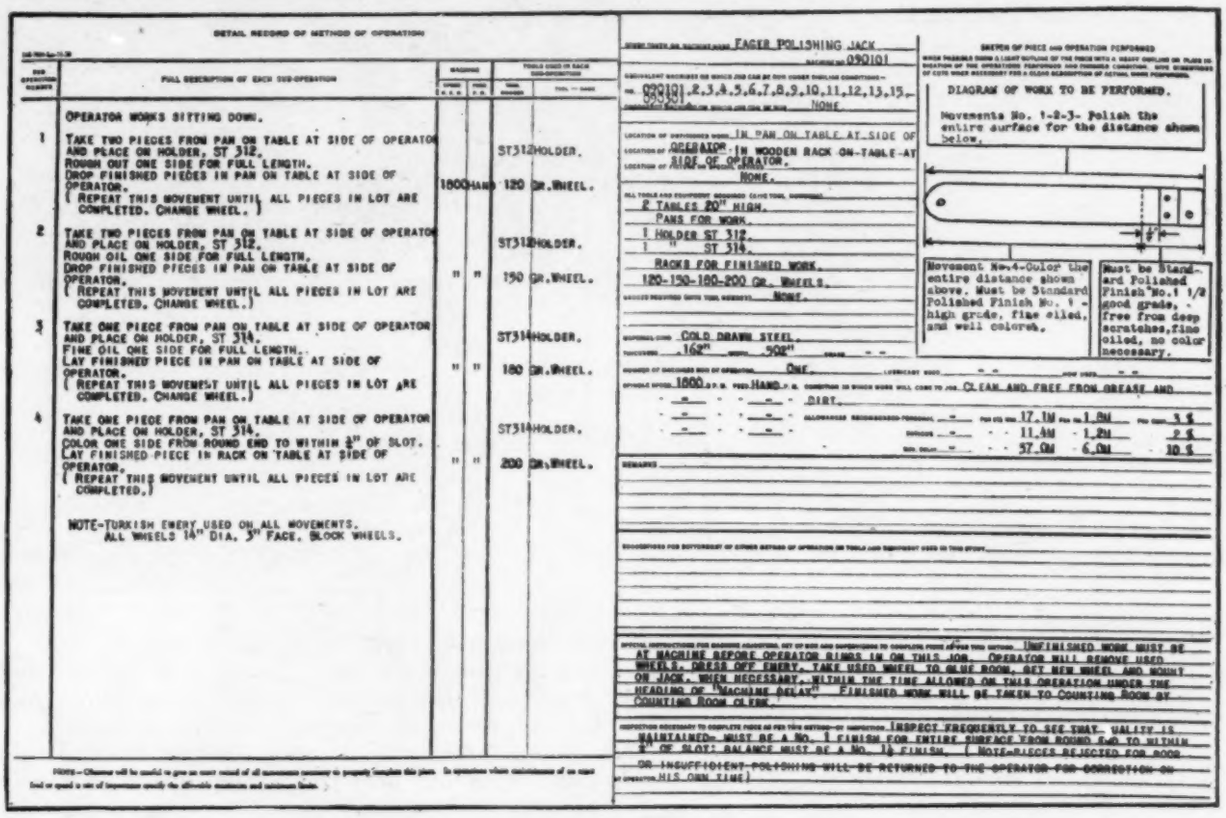
ALL QUANTITIES IN SETS PART NO.
WHEN AVAILABLE FALLS TO SETS ORDER IN QUANTITIES OF SETS
NUMBER OF PARTS PER SET

ORDERED			TRANSFERRED			IN PROCESS	TRANSFERRED			FINISHED PARTS	TRANSFERRED								AVAILABLE ASSEMBLIES UNORDERED	APPORTIONED TO N OR A ASSEM.				
ORDER NO.	STARTING DATE	QUANTITY AND BAL.	DATE	ORDER NO.	QUANTITY		DATE	ORDER NO.	QUANTITY		DATE	ORDER NO.	USED	SCRAP SALES	SCRAP	LOST	OVER MADE	UNDER MADE		DATE	POST NO.	ORDER NO.	QUANTITY	DATE ISSUED

FIG. 4—PARTS CONTROL LEDGER

methods and other matters which ordinarily are not brought to the attention of foremen, but which are of vital interest to them and tend to stimulate enthusiasm and inspire confidence. Our supervisors' conferences are addressed periodically by the president, general manager, sales manager and other officials of the company and, like the conferences which are purely for consideration of factory problems, they are always open forums for general discussion after the informal talk.

In many industries the organization is built around certain manufacturing units where a specific product may be manufactured completely. In such industries it is not uncommon to find numerous manufacturing units which are practically complete in themselves



DETAIL RECORD OF METHOD OF OPERATION

SUB OPERATION NUMBER	FULL DESCRIPTION OF EACH SUB-OPERATION	MACHINE SPEED	MACHINE FEED	TOOLS USED IN EACH SUB-OPERATION No. USED	TOOL — NAME
	OPERATOR WORKS SITTING DOWN.				
1	TAKE TWO PIECES FROM PAN ON TABLE AT SIDE OF OPERATOR AND PLACE ON HOLDER, ST 312. ROUGH OUT ONE SIDE FOR FULL LENGTH. DROP FINISHED PIECES IN PAN ON TABLE AT SIDE OF OPERATOR. (REPEAT THIS MOVEMENT UNTIL ALL PIECES IN LOT ARE COMPLETED. CHANGE WHEEL.)	1800	HAND	ST312 HOLDER. 120 GR. WHEEL.	
2	TAKE TWO PIECES FROM PAN ON TABLE AT SIDE OF OPERATOR AND PLACE ON HOLDER, ST 312. ROUGH OIL ONE SIDE FOR FULL LENGTH. DROP FINISHED PIECES IN PAN ON TABLE AT SIDE OF OPERATOR. (REPEAT THIS MOVEMENT UNTIL ALL PIECES IN LOT ARE COMPLETED. CHANGE WHEEL.)	"	"	ST312 HOLDER. 150 GR. WHEEL.	
3	TAKE ONE PIECE FROM PAN ON TABLE AT SIDE OF OPERATOR AND PLACE ON HOLDER, ST 314. FINE OIL ONE SIDE FOR FULL LENGTH. LAY FINISHED PIECE IN PAN ON TABLE AT SIDE OF OPERATOR. (REPEAT THIS MOVEMENT UNTIL ALL PIECES IN LOT ARE COMPLETED. CHANGE WHEEL.)	"	"	ST314 HOLDER. 180 GR. WHEEL.	
4	TAKE ONE PIECE FROM PAN ON TABLE AT SIDE OF OPERATOR AND PLACE ON HOLDER, ST 314. COLOR ONE SIDE FROM ROUND END TO WITHIN ⅛" OF SLOT. LAY FINISHED PIECE IN RACK ON TABLE AT SIDE OF OPERATOR. (REPEAT THIS MOVEMENT UNTIL ALL PIECES IN LOT ARE COMPLETED.)	"	"	ST314 HOLDER. 200 GR. WHEEL.	
	NOTE—TURKISH EMERY USED ON ALL MOVEMENTS. ALL WHEELS 14" DIA. 3" FACE. BLOCK WHEELS.				

NOTE—Observer will be useful to give as exact record of all movements necessary to properly complete this part. In operations where consistency of an exact feed or speed is one of importance specify the allowable maximum and minimum limits.

MACHINE FAGER POLISHING JACK No. 090101

EQUIVALENT MACHINES OR DEVICE AND CAN BE USED UNDER SIMILAR CONDITIONS— No. 090101, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 090301

DESCRIPTION OF DEVICE AND JIG OR TOOL IN USE NONE

LOCATION OF OPERATOR'S WORK IN PAN ON TABLE AT SIDE OF OPERATOR

LOCATION OF MATERIAL IN WOODEN RACK ON TABLE AT SIDE OF OPERATOR.

LOCATION OF JIG OR TOOL NONE.

ALL TOOLS AND EQUIPMENT REQUIRED (EXCEPTING TOOL HANDLED)

2 TABLES 20" HIGH.
PANS FOR WORK.
1 HOLDER ST 312.
1 " ST 314.
RACKS FOR FINISHED WORK.
120-150-180-200 GR. WHEELS.

SPECIAL TOOLS USED WITH THIS ASSEMBLY NONE.

MATERIAL USED COLD DRAWN STEEL

THICKNESS .162" WIDTH .502" GRADE —

NUMBER OF DIFFERENT KIND OF OPERATIONS ONE LUBRICANT USED — —

SPINDLE SPEED 1800 R.P.M. FEED HAND P. S. CONDITION IN WHICH WORK WILL COME TO JOB CLEAN AND FREE FROM GREASE AND DIRT.

ALLOWANCES RECOMMENDED PERSONAL — PER CENT 17.1M PER HR. 1.0M PER DAY 9 %
FATIGUE — " 11.4M " 1.2M " 8 %
TOTAL ALLOW. — " 57.0M " 6.0M " 10 %

REMARKS

DESCRIPTION FOR DIFFERENCE OF EITHER METHOD OF OPERATION OR TOOLS AND EQUIPMENT USED IN THIS STUDY.

SKETCH OF PIECE AND OPERATION PERFORMED

DIAGRAM OF WORK TO BE PERFORMED.

Movements No. 1-2-3- Polish the entire surface for the distance shown below.

Movement No. 4-Color the entire distance shown above. Must be Standard Polished Finish No. 1 - High grade, fine oiled, and well colored.

Must be Standard Polished Finish No. 1 1/2 good grade, free from deep scratches, fine oiled, no color necessary.

SPECIAL INSTRUCTIONS FOR MACHINE OPERATOR, OUT OF SIZE AND SUPERVISORS TO COMPLETE PIECE AFTER THIS METHOD. UNFINISHED WORK MUST BE AT MACHINE BEFORE OPERATOR BINDS IN ON THIS JOB. OPERATOR WILL REMOVE USED WHEELS, DRESS OFF EMERY, TAKE USED WHEEL TO GLUE ROOM, SET NEW WHEEL AND MOUNT ON JACK, WHEN NECESSARY, WITHIN THE TIME ALLOWED ON THIS OPERATION UNDER THE HEADING OF "MACHINE DELAY." FINISHED WORK WILL BE TAKEN TO COUNTING ROOM BY COUNTING ROOM CLERK.

INSPECTION NECESSARY TO COMPLETE PIECE AS PER THIS METHOD—OF INSPECTION. INSPECT FREQUENTLY TO SEE THAT QUALITY IS MAINTAINED— MUST BE A No. 1 FINISH FOR ENTIRE SURFACE FROM ROUND END TO WITHIN ⅛" OF SLOT; BALANCE MUST BE A No. 1½ FINISH. (NOTE—PIECES REJECTED FOR POOR OR INSUFFICIENT POLISHING WILL BE RETURNED TO THE OPERATOR FOR CORRECTION ON OPERATOR'S OWN TIME)

TIME STUDY OBSERVATION SHEET

CORONA TYPEWRITER CO., INC.

PART No. X10 50A OPERATION No. 12 OPERATION NAME POLISH INSIDE

OPERATOR No. 256 OPERATOR'S NAME W. JONES.

OPERATION PERFORMED IN DEPT No. 6 UNIT TIMED ONE PIECE.

OBSERVERS OPINION OF OPERATOR— EXPERIENCE NUMBER OF MONTHS ON THIS TYPE OF WORK YES.
SKILL HIGH GRADE POLISHER.
CO-OPERATION WITH OBSERVER FAIR-DID NOT HURRY ANY.

PURPOSE OF THIS STUDY— FOR PRELIMINARY SURVEY AND RATE SETTING COMPARISON.
FOR TIME OF OPERATION PREVIOUS RESULT

SUB OPERATION NUMBER	SUB-OPERATION	UNIT TIMES RECORDED IN MINUTES AND HUNDREDTHS (1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40)	AVERAGE TIME	NUMBER TIME	TIME ADDED TO
1	ROUGH OUT.				
2	ROUGH OIL.				
3	FINE OIL.				
	"				
4	COLOR.				
	"				
	(CONTINUED)				
1	ROUGH OUT.		3285	.29	.49
2	ROUGH OIL.		4524	.40	.42
3	FINE OIL.				
	"		.24	.19	.20
4	COLOR.				
	"		.384	.30	.35
	(DRESSING OFF AND CHANGING WHEELS.)				

NOTE - When possible record time for each sub-operation by continuous reading of watch, running to one side or completion of each unit. Record elapsed time opposite to each sub-operation in red ink. Observer must exercise extreme care in making reading for Production Time or Standard Time and Rate setting purposes, to see that proper sequence of operations is maintained, that all unnecessary sub-operations or moves are eliminated, that proper appliances are provided, including aids, to facilitate operation and that the proper and most economical combinations of speed and feed are used. In right hand column above, observer will give his opinion of the time that should be taken for each sub-operation by a fair and thoroughly experienced man, working at his best normal speed. Observer will record a sufficient number of times to give a clear idea of the time required by the operator, for each sub-operation.

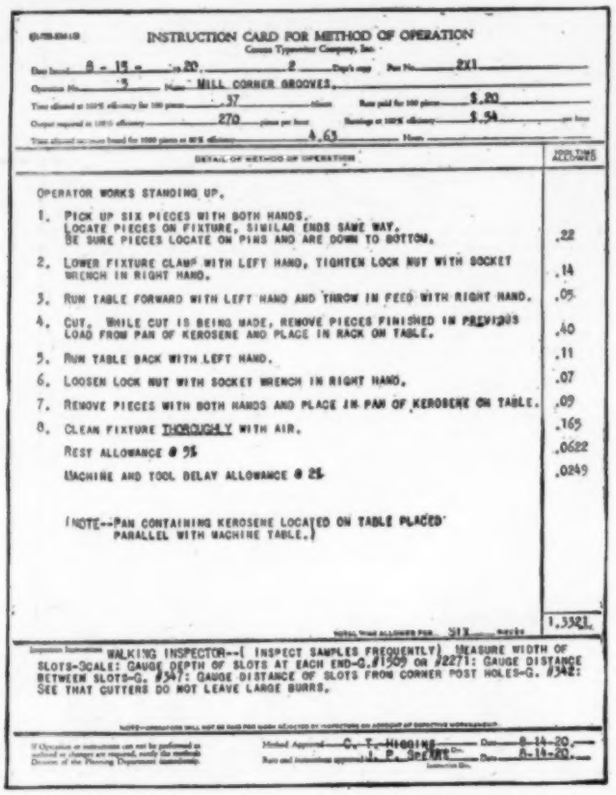
TOTAL AVERAGE 1.40 1.18 1.26

OBSERVER W. V. Williams.

DATE 9-13-20

FIG. 5—TIME STUDY OBSERVATION SHEET, FRONT AND BACK

although possibly in the same building, and where there may be two or three machine shops, a number of plating or japanning rooms, etc. In our factory we have attempted to thoroughly departmentalize all processes so that all similar operations shall be performed in the same department. For example, we concentrate all milling operations in the milling department and all punch press operations in the punch press department.



INSTRUCTION CARD FOR METHOD OF OPERATION

Corona Typewriter Company, Inc.

Date Issued 8-15-20 Dept's copy Part No. 2X1

Operation No. 5 Name MILL CORNER GROOVES.

Time allowed at 100% efficiency for 100 pieces .37 hours Rate paid for 100 pieces $.20

Output required at 100% efficiency 270 pieces per hour Earnings at 100% efficiency $.54 per hour

Time allowed on more than one piece at 100% efficiency 4.63 Hours

DETAIL OF METHOD OF OPERATION	ALLOWANCE
OPERATOR WORKS STANDING UP.	
1. PICK UP SIX PIECES WITH BOTH HANDS. LOCATE PIECES ON FIXTURE, SIMILAR ENDS SAME WAY. BE SURE PIECES LOCATE ON PINS AND ARE DOWN TO BOTTOM.	.22
2. LOWER FIXTURE CLAW WITH LEFT HAND, TIGHTEN LOCK NUT WITH SOCKET WRENCH IN RIGHT HAND.	.14
3. RUN TABLE FORWARD WITH LEFT HAND AND THROW IN FEED WITH RIGHT HAND.	.05
4. CUT. WHILE CUT IS BEING MADE, REMOVE PIECES FINISHED IN PREVIOUS LOAD FROM PAN OF KEROSENE AND PLACE IN RACK ON TABLE.	.40
5. RUN TABLE BACK WITH LEFT HAND.	.11
6. LOOSEN LOCK NUT WITH SOCKET WRENCH IN RIGHT HAND.	.07
7. REMOVE PIECES WITH BOTH HANDS AND PLACE IN PAN OF KEROSENE ON TABLE.	.09
8. CLEAN FIXTURE THOROUGHLY WITH AIR.	.165
REST ALLOWANCE @ 5%	.0622
MACHINE AND TOOL DELAY ALLOWANCE @ 2%	.0249
(NOTE--PAN CONTAINING KEROSENE LOCATED ON TABLE PLACED PARALLEL WITH MACHINE TABLE.)	
TOTAL TIME ALLOWED PER 51%	1.3321

Inspection Instructions WALKING INSPECTOR--(INSPECT SAMPLES FREQUENTLY) MEASURE WIDTH OF SLOTS-SCALE: GAUGE DEPTH OF SLOTS AT EACH END-G.#1509 OR #2271: GAUGE DISTANCE BETWEEN SLOTS-G. #347: GAUGE DISTANCE OF SLOTS FROM CORNER POST HOLES-G. #342: SEE THAT CUTTERS DO NOT LEAVE LARGE BURRS.

If Operation or instructions can not be performed as outlined or changes are required, notify the methods Director of the Planning Department immediately.

Method Approved C. T. HIGGINS Date 8-14-20

Rate and Instructions approved J. P. SPERRY Date 8-14-20

FIG. 6—INSTRUCTION CARD FOR OPERATORS, FRONT

MACHINE AND SET UP INSTRUCTIONS

Machines (on which job can run piece work) 030A01 - 030A04

Emergency machine (on which job can be run, but not on piece work) NONE

Location of finished work IN RACK ON TABLE, PARALLEL WITH MACHINE TABLE.

Location of unfinished work " " " " " "

Condition in which work will come to job CLEAN AND FREE FROM CHIPS, AS LEFT BY PREVIOUS OPERATION.

Material Kind ROLLED STRIP ALUMINUM Thickness .162" Width 2.730" Grade 2S

Number of machines run by operator ONE Lubricant used COMPOUND How used POUR

Speeds Spool 960 R. P. M. Feed .44" P. M. Frequency of sharpening Tools

" " " " " "

" " " " " "

" " " " " "

Tools located in tool Crib No. # 10

All Tools, Equipment and gauges required (Give all Tool numbers)

1 FIXTURE #207	2 STEEL TABLES	1 GAUGE #1509-2271
1 CUTTER ST275	1 DRIP PAN (FOR MACHINE TABLE)	1 " 347
1 " ST276	1 RUBBER HOSE (TO DRAIN DRIP PAN)	1 " 342
1 SOCKET WRENCH ST-- AIR CONNECTIONS	1 " " MACHINE TABLE)	
	PAN OF KEROSENE	

INSTRUCTIONS FOR SET UP OF JOB — TOOL TIME ALLOWED

METHOD OF SET UP NOT STANDARDIZED. SUPERVISOR OR SET UP MAN WILL SEE THAT ALL TOOLS, GAUGES ETC., ARE AT THE MACHINE: THAT SPEED AND FEED IS CORRECT: THAT WORK IS AT THE MACHINE: THAT QUALITY TURNED OUT IS CORRECT, BEFORE AN OPERATOR IS ASSIGNED TO THIS JOB.

TOTAL TIME ALLOWED

Note—Regular hourly rate will be paid for setting up emergency machines. Supervisor are responsible for the accuracy of all set ups and must approve samples of work from each set up, before set up job will be considered completed.

FIG. 7—INSTRUCTION CARD FOR OPERATORS, BACK

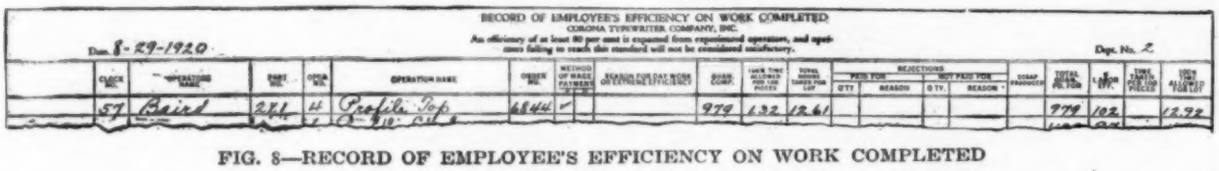
There are only a few instances where this plan is not strictly followed.

There are 671 parts on the typewriter, 139 on the case, 110 on the folding stand, a total of 920 parts. There are 355 different parts on the typewriter, 61 on the case and 37 on the stand, a total of 453 different parts. There are 1,999 manufacturing operations on the typewriter, 210 on the case, and 205 on the stand, a total of 2,414 operations, exclusive of inspection. To these must be added 38 subassembly operations and 15 assembly operations, a total of 53 assembly operations, and a grand total of 2,467 operations of all kinds, exclusive of inspection. If inspections are added, the total number of operations performed amount to approximately 4,600.

All mechanical methods are carefully studied by the methods division of the planning department before manufacturing routines are written and these studies are supposed to be sufficiently exhaustive so that few changes, if any, will have to be made once they have been established as standard practice. Based on the information gathered the data are written up on operation routine cards, Fig. 2, which contain the routine of all parts and give the various operations performed on the parts, including all inspection necessary.

In so far as possible all production tools are manufactured in our own plant. Machinery on the other hand is never specially made if we can secure results with a standard product. We would prefer to buy a standard machine and adapt it to special needs rather than to make it or have it made specially to our design. With machines we endeavor to hold to close standardization so that we may have as many machines of like design and capacity as possible, but with tools we endeavor to highly specialize in order to secure maximum production of the highest quality at the lowest cost. Machines are grouped so that routing is facilitated through our being able to route work to any machine in a group.

Whenever a new part or design is released by the experimental department a sample part and blueprint of the part are issued by them, giving tolerances and size, and grade of stock to be used. These are sent to the production equipment engineering department so that the necessary tools for manufacturing may be designed. After the tools are designed, the prints are issued to the toolroom and the tools are built. Upon completion and inspection of each tool, sample parts are submitted to the experimental and designing department for approval, and when they are approved the tool is turned over to the methods division of the plan-



RECORD OF EMPLOYEE'S EFFICIENCY ON WORK COMPLETED

CORONA TYPEWRITER COMPANY, INC.

An efficiency of at least 80 per cent is expected from experienced operators, and operators failing to reach this standard will not be considered satisfactory.

Date 8-29-1920 Dept. No. 2

CLOCK NO.	OPERATOR'S NAME	PART NO.	OPER. NO.	OPERATION NAME	ORDER NO.	METHOD OF WAGE PAYMENT	STANDARD FOR DAY WORK OR EXPENSE EFFICIENCY	BASIC COMP.	TOTAL HOURS TAKEN FOR LOT	REJECTIONS PAID FOR QTY.	REJECTIONS PAID FOR REASON	REJECTIONS NOT PAID FOR QTY.	REJECTIONS NOT PAID FOR REASON	SCRAP PRODUCED	TOTAL PRODUCTION	LABOR EFF.	TIME TAKEN PER 100 PIECES	TIME ALLOWED PER LOT
57	Baird	2X1	4	Profile Top	6844	✓		979	12.61						979	102		12.32

FIG. 8—RECORD OF EMPLOYEE'S EFFICIENCY ON WORK COMPLETED

ning department which sets up and operates the tool and issues the proper routine instruction card covering its use. The sample parts made by the tool must be approved by the parts inspection department before the tool may be placed in the toolcrib for production.

All tools and gages are numbered, and stored in the toolcrib by operations so that in ordering out tools it it necessary only to specify those needed for a certain facture from raw material, parts which we purchase ready for immediate use, and purchased parts on which we have to perform some manufacturing operations. Our routine cards show exactly what classification the parts belong in and what manufacturing operations, if any, are performed.

Parts which we buy and on which no operations are performed are ordered from a balance of stores ledger,

OPERATION EFFICIENCY RECORD
CORONA TYPEWRITER COMPANY, INC.

OPERATION NO. 5 NAME Mill Corner Grooves PART NO. 2761

Date 1920	Operator No.	Operator Name	Order Number	Method of Wage Payment P	Method of Wage Payment D	Reason for Day Work	Quantity Completed	100% Time per 100 Pieces	Total Hours Taken for Lot	Rejections Paid For Quantity	Rejections Paid For Reason	Rejections Not Paid For Quantity	Rejections Not Paid For Reason	Scrap Produced	Total Quantity Paid For	% Labor Eff.	Time Taken per 100 Pieces	100% Time Allowed For Lot
7-3	57	Baird	6844		✓	7	2063	—	15.68						2063	—	.76	—
7-17	53	Brown	"		✓	7	3075	—	224						3075	—	.72	—
7-26	57	Baird	"		✓	7	4080	—	2326						4080	—	.57	—
7-30	1222	Dodge	"		✓	7	1010	—	6.16						1010	—	.61	—
July 1920		MONTHLY TOTALS AV. QUALITY EFF.	—					P.W.	—									
		AV. LABOR EFF.	0					D.W.	67.44									
		PER CENT OF P. W.	0															
8-6	1222	Dodge	7013		✓	7	1290	—	8.32						1290	—	.64	—
8-10	"	"	"		✓	7	750	—	3.14						750	—	.41	—
8-13	"	"	"	✓			1800	.37	7.01						1800	95	—	6.66
8-17	57	Baird	"	✓			2260	"	9.10						2260	92	—	8.36
8-23	"	"	"	✓			1698	"	5.87						1698	107	—	6.28
8-29	1222	Dodge	"	✓			2300	"	7.59						2300	112	—	8.51
Aug.		MONTHLY TOTALS AV. QUALITY EFF.	—					P.W.	29.57									29.81

Note—Record clerk will figure the average labor efficiency of each operation and the efficiency of quality at the end of each month. To find the average labor efficiency for the month divide the total of the column headed "100% time allowed for lot," by the total of the column headed "Total hours taken for lot." To find the efficiency of quality, divide the total of all rejections and scrap, during the month, by the total of the column headed "Quantity completed" and deduct the quotient from 100.

FIG. 9—OPERATION EFFICIENCY RECORD

OPERATORS EFFICIENCY RECORD
CORONA TYPEWRITER COMPANY, INC. Transfered to dept 2 7/1/20 { 102 Dept 3; 57 " 2; " "

OPERATORS NAME 10 Baird OPERATORS CLOCK NO.

Date 1920	Part or Job Number	Oper. No.	Operation Name	Order Number	Method of Wage Payment P	Method of Wage Payment D	Reason for Day Work	Quantity Completed	100% Time per 100 Pieces	Total Hours Taken for Lot	Rejections Paid for Q'ty	Rejections Paid for Reason	Rejections Not Paid for Q'ty	Rejections Not Paid for Reason	Scrap Produced	% Labor Eff.	Time Taken per 100 Pieces	100% Time Allowed For Lot
6-1	K151	11	Drill card-reject hole	5803	✓			610	.448	2.90	2	Broken drill			2	44		2.73
"	2892	4	Drill all holes	9971	✓			182	2.34	4.16						104		4.34
6-2	"	"	"	9227	✓			240	"	5.23	1	Broken drill			1	131		6.93
"	K210	23	Tap holes on slot	9181	✓			38	.75	.40						108		.43
"	K90	19	Ream	9996	✓			2500	.119	2.98						119		2.97
6-3	2891	4	Drill all holes	9855	✓			973	1.11	11.20						125		14.05
6-4	"	"	"	"	✓			907	"	12.40	1	Broken drill			1	117		14.60
6-5	—	5	Burr all holes	9253	✓			1000	.383	3.41						97		3.79
"	—	—	Cleaning up room			✓	26	—	—	.25						—		—
6-5	M5174	5	Tap 3 holes	1378	✓			H110	.279	10.00						114		11.96
"	K17	4	Tap	8525	✓			1595	.367	4.81						117		5.77
6-12	2891	4	Drill all holes	9993	✓			2250	.151	3.09						113		4.27
"	K151	14	Ream in bore	5803	✓			1010	.115	1.34						112		1.37
"	—	—	Cleaning department	—		✓	26	—	—	.25						—		—
6-17	2891	4	Drill all holes	9998	✓			1700	1.81	24.00	2	Broken drill			2	106		30.77
6-18	2892	5	Burr all holes	9237	✓			1408	.66	10.00						92		9.29
"	K-21	15	Ream & burr	9123	✓	1		300	.268	3.75						87		2.14
6-19	—	—	Cleaning department		✓	26		—	—	.25						—		—
6-21	16518	52	Ream & burr	5140	✓	9		238	—	1.00						✓		—
"	M23214	5	Spot face and drill	9464	✓	9		136	—	.76						✓		—
"	M4702	51	Re-tap part	9155	✓	9		671	—	.89						✓		—
"	K151	10	Tap	8703	✓	9		1500	—	1.96						—	.13	—
"	M4702	51	Re-tap part	9710	✓	9		667	—	1.61						—		—
"	M3214	2	Tap	9066	✓			H66	.28	1.14						114		1.30
6-24	2891	4	Drill all holes	9911	✓			2394	1.31	31.14						112		42.43
6-25	2892	4	Drill all holes	9999	✓			333	2.39	7.63						106		8.00
6-26	—	—	Cleaning department			✓	26			.25						—		—
6-29	2917	4	Drill all holes	9856	✓			774	2.37	18.04						100		18.48
6-30	K151	11	Drill card-reject hole	5803	✓			1260	.448	5.28	2	Broken drill			2	187		5.69
"	84	7	Inspection	9999	✓			2450	.24	5.22						112		5.83
June 1920			MONTHLY TOTALS AV. QUALITY EFF. AV. LABOR EFF. 112% PER CENT OF P.W. 95.6%						P.W. D.W.	209.61 9.87								244.26
7-1	K210	L	Called 65 replacement office Burr edge & drill angle	9596	✓	41 1		H00	531	3.72						87		2.12

Note—Record clerk will figure the average labor efficiency of each operator and the efficiency of quality at the end of each month. To find the average labor efficiency for the month divide the total of all items upon which a standard time is set, as shown in column headed "100% time allowed for lot," by the total of similar items in column headed "Total hours taken for lot." To find efficiency of quality, divide the total of all rejections and scrap, during the month, by the total of the column headed "Quantity completed" and deduct the quotient from 100.

FIG. 10—OPERATOR'S EFFICIENCY RECORD

operation and part number. Upon the completion of an operation all tools, together with from 15 to 25 of the last parts made by each tool and a tool service slip giving the number of parts made and commenting on the condition of the tool, are sent to the tool inspection section. A careful inspection is made and if any defects are found the tool is immediately sent to the toolroom to be conditioned. Upon completion of the conditioning of the tool it is returned to the tool inspection section, is again inspected and if found O. K. is placed in its proper location in the toolcrib with the last parts made.

Our machine is made up of parts which we manufacture from raw material, parts which we purchase ready for immediate use, and purchased parts on which we have to perform some manufacturing operations. Our routine cards show exactly what classification the parts belong in and what manufacturing operations, if any, are performed.

Parts which we buy and on which no operations are performed are ordered from a balance of stores ledger, Fig. 3, the same as raw material and are sent directly into finished parts stock. Parts which we purchase and on which we do perform manufacturing operations are treated as raw material and are carried on the balance of stores ledger. All parts, no matter what their classification, are carried in a parts control ledger, Fig. 4, with a sheet assigned to each part number.

All operations for each part with information as to the department in which each process is performed, are contained in a routine card made up by the methods division. The routine of handling work in planning centers is given in a planning center clerk instruction

sheet which shows the standard time keeping methods that have been found best in facilitating the work of costing and pay roll keeping, and the methods of properly handling, counting, and moving the work through the various manufacturing operations. Major planning is handled by the control board section of the route division of the planning department. This section posts on its control board the various manufacturing orders with lot sizes, time for completing the work and group of machines on which the work is to be performed. Instruction cards are issued to the operators for all operations.

Materials

Under the classification "Materials" we have two important records, part list and material specifications. The part list, as its name implies, gives the part number and name of all parts and subassemblies. The material specifications are cards made out in the record section of the methods division from information received from the experimental and designing department and from the production equipment engineering department, the former furnishing data as to size, kind and grade of material, and the latter the number of pounds required to make one thousand parts, the nature of the material (whether strip, coil, rod, etc.), and the lengths that shall be bought for strip, rod or bar stock. These specifications are used by the methods division and stores division of the planning department and by the purchasing department.

In a record known as "Machine Burden Record," we list all production machinery by department and by machine number, grouping machines in classes according to the work which they perform. Each group of machines is given a code number by the production equipment engineering department and this code number readily identifies each machine by department and classification. The record also gives the average time required for performing each manufacturing operation on one hundred parts and this figure is corrected quarterly, using the efficiency record for the last quarter. Where methods are changed the record is immediately changed without waiting for the quarterly period.

The record is kept up-to-date by the record section of the methods division, although used primarily by the control board section in planning its work on the control board. The information is essential to the control board section, both because it gives operation time and because it enables the allocation of work to machine groups and thus equalization of the production demand on all machines in the group.

Time Study, Instruction Cards and Performance Records

Before any work can be done by the instruction card section of the methods division a routine instruction card must be made out for the part that is to be studied and standardized. This is done from information received from the experimental and designing department and the production equipment engineering department. The card has been described elsewhere. The methods section then furnishes the instruction card section with all of the necessary data as to the proper methods of manufacture to be followed, and with this information available the time study observation is made. For this purpose a time study observation sheet shown in Fig. 5, is used. After the time study man has determined on the rate which he feels is satisfactory and up to standard, he presents his conclusion and supporting data on a proposal sheet. This sheet gives all of the information necessary to enable the head of the planning department and the works manager to pass on the proposed rate, and upon their approval the instruction card, Figs. 6 and 7, showing the method of operation, is issued. The standard having been set and the operator having been instructed to perform the work according to the instruction card and the piece rate being established by the issuing of the card with the work, the operator is run in on an operation cost ticket and completes the lot assigned to him. Upon completion of the work the operation cost ticket accompanies the work to the planning center, the time is recorded, inspection made and rejections recorded and the planning center clerk posts the accomplishment on the record, shown in Fig. 8, of the employee's efficiency on work completed. This record is made out in duplicate, one copy being sent to the department supervisor to be posted in the department if desired, and the other is sent to the record section of the methods division. From the record of employee's efficiency, the record section posts operation efficiency, and operator's efficiency records, Figs. 9 and 10, which are always available for the purpose of comparing earnings of individuals, relative efficiency of operators on the same operation, and other information of similar nature. Probably the greatest value of the two records is in furnishing information to the methods division as to the relation of accomplishment to theoretical standards.

Special Compensation

It sometimes happens that piece work operations have to be run day work because, although the operation ticket is stamped "Piece Work," the supervisor finds that he cannot, in fairness to the operator, run on piece work. This may be occasioned by the fact that an operator is a learner; that the wrong class of labor is employed, as for example, a man on a woman's job; that piece work has been temporarily suspended because of changes in previous operations or part design; or some other cause of a like nature. In such cases, change to day work is made on approval of the works manager. Occasionally in order to secure balance of production, we are obliged to transfer a man from one operation or job to another. In such cases, where there is sufficient work ahead of the man on his regular job and he is transferred because of his special knowledge of another job, but may not be a high efficiency man on that job because of lack of recent practice, we provide a special method of compensation so that he will not be penalized for his greater value to the company. It may also happen that changes in design cause the temporary suspension of piece rates through no fault of the operator and we feel that he or she should be compensated fairly during the time that the job is under time study observation for change. In all of these cases the supervisor requests a special hourly rate for the operator and, if granted by the works manager, a special hourly rate card is made out on which a rate is given based on the last four weeks' average piece work earnings of the operator. This card is in two parts, is sent to the works manager for approval, then the upper part is sent to the cost department and the lower part to the department supervisor who turns it over to the planning center clerk. It then becomes the duty of the planning center clerk to see that all time tickets of the operator, for the work and during the time authorized on the

special hourly rate card, are stamped "Special Hourly Rate No. . . . . ," giving the number of the card.

The company has an established policy that no piece rates may be changed unless they are set too low, in which case they will be adjusted upward to what is considered standard, or in cases where radical changes have been made in the method of performing an operation and the operations are directly affected or where previous operations have been changed or parts redesigned. This is a precaution against the lowering of rates because they may have been loosely set. In order that operators may be fully cognizant of this rule we have placed on every instruction card holder a slip stating our piece work policy.

(To be concluded next week)

Commerce Department Swamped with Foreign Trade Inquiries

Remarkable, nation-wide interest in foreign markets, reflected by a 400 per cent increase in inquiries directed to the Department of Commerce by American business establishments of all kinds, during 1922 over 1921, is disclosed in the annual report of Director Julius Klein of the Bureau of Foreign and Domestic Commerce, made public today.

The report, covering the fiscal year ended June 30, 1922, indicates that nearly 600,000 letters, each one dealing with a specific foreign trade problem, and thousands of routine inquiries, were received and answered by the Bureau during the period mentioned. The number per day increased from 1,000 in July, 1921, to nearly 3,000 at the close of the year on June 30, 1922.

More than 50,000 manufacturers and merchants called in person during the year at the Bureau's branch offices in the leading cities to discuss export matters. Over 350,000 confidential circulars (each on a given trade prospect), and nearly 1,000,000 lists of prospective foreign buyers were prepared for the use of business men.

The largest Italian contract awarded in years amounting to $13,000,000, was secured for an American firm through the help of the Bureau's office in Rome. The rights of American shippers of goods valued at $68,000,000 to $80,000,000, caught in the port congestion in Cuba, were successfully safeguarded through the aid of the Bureau's Havana representative. The Vienna office enabled an American concern to obtain an order for $1,500,000, and the Madrid office saved for American exporters contracts in Spain covering 100,000 tons of wheat. All were worth-while contracts.

Reports Available to Many Readers Regularly

Through an effective arrangement with several hundred newspapers and trade journals reports of the Bureau are now made immediately available to between 5,000,000 and 10,000,000 readers regularly, compared with a few thousand the previous years. As a result of a new system of press releases, one of the Bureau's most important services involving specific market openings in all parts of the world has been made simultaneously available in every section of the United States, for the first time in the history of American official trade promotion.

Describing the fiscal year 1921-22 as "one of the most crucial periods in the history of the nation's foreign trade" Director Klein points to the complete reorganization of his Bureau under Secretary Hoover's direction as the prime factor enabling it to help American export interests withstand the "inroads of recovering European competition in the world's markets."

Following out the policy of "better service with less meddling," Director Klein says that the Bureau of Foreign and Domestic Commerce now serves business on a commodity basis, through seventeen new divisions which specialize on America's great export products of the factories and farms. These divisions are headed by sales experts selected by the trades themselves and guided in their work by about 70 committees composed of business men representing over 150,000 manufacturers and merchants in the leading export industries of the country. This arrangement insures a maximum service to each industry at a minimum outlay of time, labor and money.

In addition to the commodity divisions, the reorganization program included the creation of a Division of Commercial Laws and a Transportation Division so that business men could be supplied with expert and technical advice in those complicated fields of export effort. In addition, the Bureau's regional divisions were enlarged and expanded generally as were its other services.

In concluding his report, Dr. Klein states that if the Bureau is to carry on and enlarge its work in the manner dictated by the economic situation of the country, its activities should be extended to cover the study and promotion of domestic commerce. Its foreign service should be strengthened by the establishment of offices in new markets. Experts in commodities not yet specifically provided for, such as tobacco, grain, and many manufactured specialties, should be added to its present staff to meet the increasing demands of the trades. The salaries of many statutory positions should be considerably increased, otherwise the Bureau will continue to lose some of its more valuable help.

The Psychology of Noise

By Charles W. Lee

I once worked, or at least was employed, in a drafting room which was partitioned off from the main shop in such a way that about a foot of the shafting projected through the partition.

Whenever the shop was idle from a temporary shutdown there wasn't much work done in that drafting room until work was resumed in the shop. Or if the shop was shut down for a day or more, but the drafting room supposed to be working, one by one the draftsmen (including me) would pull the covers down over the drawings and "silently steal away." This caused "the old man" to remark that the shaft furnished power for the drafting room as well as for the shop.

One of the "funny papers" once told of a New Yorker who went away up into the country for quietness and rest. He got the quietness all right but didn't get the rest because he couldn't sleep, until he conceived the idea of hiring a man to cart railroad iron back and forth in front of the house. Then he slept very well.

And this, as I see it, shows why we couldn't work when the shaft did not turn. The unusual in the shop quietness was so distracting that we could not think straight. As thought is necessary to proper drafting, the shaft really did furnish the power for the drafting room, and the old man was right, as he often was.

Five Interesting Grinding Operations

Including surface, cylindrical and internal grinding on a variety of work, with five entirely different types of grinding machines

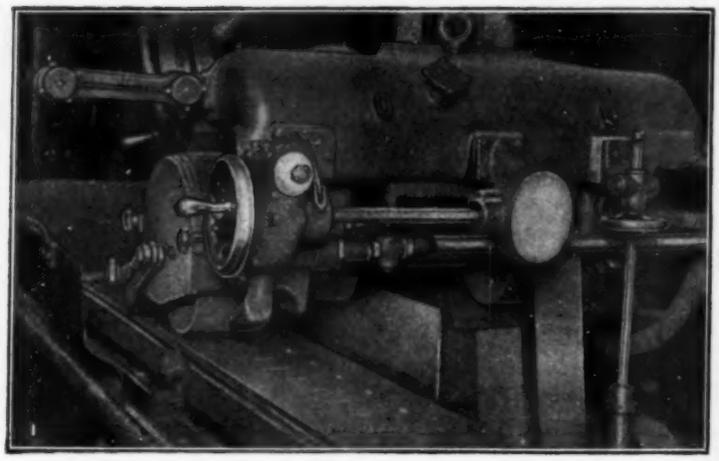


Fig. 1—Turbine bridges 6 x 6 x 8 in. 3½ per cent nickel steel. Norton grinding machine, 15 x 15 in. x 12 ft. Trolley wire for magnetic chuck under table. Table speed 71 ft. per minute. Wheel 36-24 J, 6 in. wide.—General Electric Co., Schenectady, N. Y.

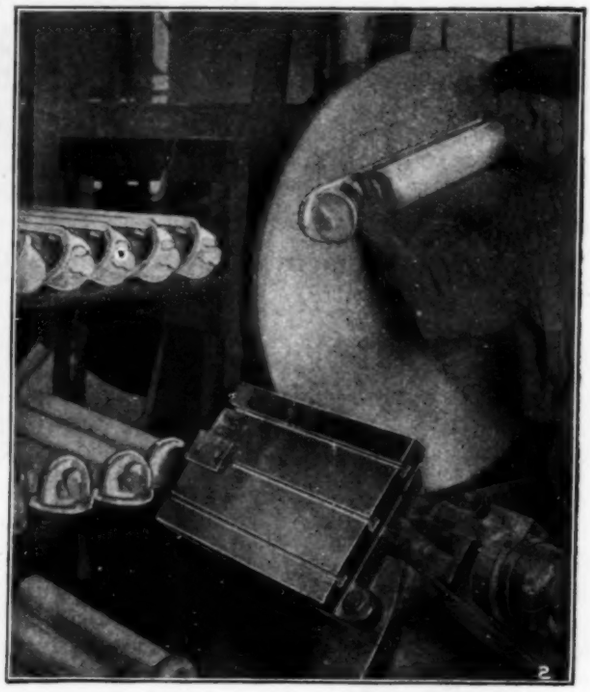


Fig. 2—Aluminum airplane motor cylinder-cover 5¼ x 31 in. Remove 7/32 in. Gardner No. 8 grinding machine. 40 in. disk K-ITE. 24 grit. 40 pieces in 9½ hours.—Wright Aeronautical Co., Paterson, N. J.

Fig. 3—Piston rings 4⅜ in. diam. 50 rings on mandrel. Remove 0.030 in. in four operations—average 0.007 in. per grind. Carborundum wheel 14 x 1¼ in. Grit 303. Grade M. Bond B-3. Speed 2,200 r.p.m. 2,700 rings in 9 hours.—United States Piston Ring Co., Irvington, N. J.

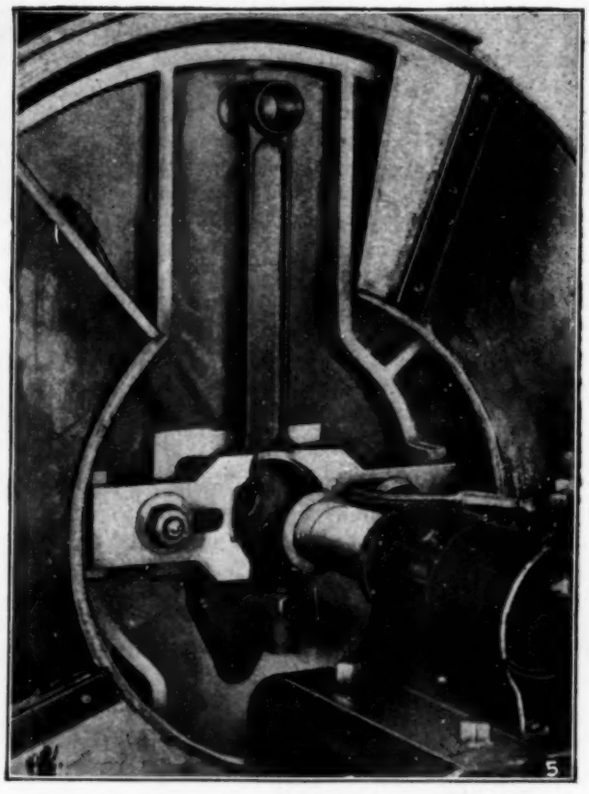


Fig. 5—Liberty engine connecting rods. Heald internal grinding machine. Norton wheel 2¼ x ¾ in. Grain 38-60. Grade K. Ground Wet. Cutting speed 4,000 ft. per minute. 90 rods in 9 hours. One operator.—Lincoln Motor Co.

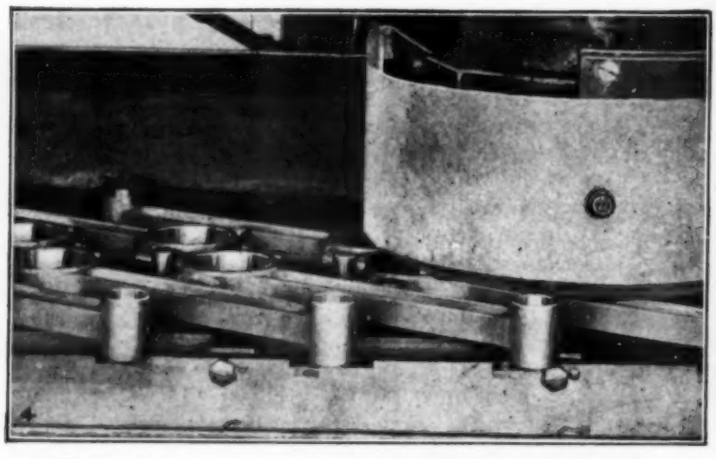


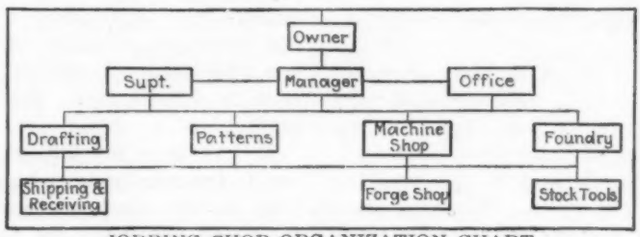
Fig. 4—Liberty engine connecting rods. Pratt & Whitney surface grinding machine. Norton ring wheel, 14 x 4 in. No. 38-30 J. Fixture holds 8 rods. Wheel speed 5,000 ft. One operator on two machines ground 800 rods, both sides, in 9 hours.—Lincoln Motor Co.

Management of the Machine Jobbing Shop

By H. L. WHEELER

Distinction between manufacturing and jobbing—Systems, operations and methods—How orders are received and handled—What the jobbing shop management should avoid

JOBBING SHOPS, like manufacturing enterprises, vary widely in size as well as in the nature of product turned out, but the problems of the management are quite different. The art of cutting metals is equally known to each, many of the same machines and tools are used, much of the equipment is common to both and the same materials are as familiar to one as to the other, but in so far as the application of systems and methods is concerned there can be but little or no comparison.



JOBBING SHOP ORGANIZATION CHART

Generally speaking, the production activities of a manufacturing plant may be anticipated. The market for its product is in some degree known and the volume of production may, therefore, be calculated within reasonably close limits. In dull times it may continue to run in expectation of a revival of trade and thus be enabled to avoid a complete shut-down and consequent disintegration of its organization. Owing to the specialization of its operations it is comparatively easy to recruit a production force at any time and to train new hands as necessary.

The best and most up-to-date equipment is none too good for the manufacturing plant. Material may be purchased in quantities based upon a prearranged production schedule and regulated to some extent by the demand for the product. Therefore, such an establishment may run more nearly like a machine for the reason that its operations and its men can be timed to any practical rate of speed desired. Every operation can be reduced to such simple forms that the average man on the street may be turned into a good automaton in a few hours. Even the management may often be automatic in thought, word or action as it executes its various functions of the system.

Conditions Differ Widely

The jobbing shop may be anything from a hole in the wall with but two or three men, to a large and pretentious establishment employing two or three hundred. The class of work turned out may run all the way from mending a baby carriage to the rebuilding of a triple-expansion engine. Each and every job is different and seldom is the same job repeated or produced in quantities. Many jobs call for makeshift devices and methods that sometimes appear to be a waste of time and money. A large part of the work of the average jobbing shop is emergency repair work and it would be the height of folly, even if the time could be spared, to purchase a new and expensive tool to do some special job that might never recur, and it is for that reason that makeshifts must be resorted to upon occasion. There are few details that can be anticipated from day to day. The management and men are called upon to perform every conceivable kind of a job, in all kinds of weather, day or night, depending upon the size of the shop and the particular kind of business catered to. The whole organization must, therefore, be prepared at all times to make quick decisions and act without hesitation or much forethought. It must also be borne in mind that these decisions must be right and the work right or the business will suffer. There is no time to wait upon systems or ceremony, especially in shops where emergency repair work is handled.

Systems, such as those in daily use in the large manufacturing plants, would be hopelessly tangled up in half an hour and all the efficiency engineers and cost accountants in this and the other world could not straighten them out again. The superintendents and foremen must carry most of their system right under their hats. The big boss or owner usually can tell by a glance at the bank balance which way the wind blows and there is little or no need for hairsplitting cost systems or efficiency engineers, as they would almost invariably double or triple the office force and introduce a great deal of red tape that is more of a hindrance than a help to the shop or its customers.

Overhead Must Be Kept Down

The secret of success in the jobbing business is to keep the overhead down to a minimum. The office force should be picked with great care and trained to do double duty when necessary. Small shops employing up to twenty-five men do not require much system or a large office force. Usually one bookkeeper and a stenographer can handle all office details and any clerical work to be done for the shop foreman. Shops employing from fifty to one hundred men can be run successfully with but three people in the office, including the manager. Needless to remark that all should have extraordinary ability and that the manager will have to be all over the place and on his mettle every minute, as every task, no matter how trivial, in a shop of this size calls for initiative and resourcefulness. A good combination for such an office force would be a draftsman, a stenographer and a bookkeeper, in addition to the manager. The manager should be a mechanical engineer and preferably one who has been

through the shop. There should be a superintendent and a foreman for each department.

For illustration it may be assumed that a shop employing one hundred men, including machine shop, forge shop, pattern shop and foundry, will do a business amounting to three hundred thousand dollars a year. For this size of shop the non-productive contingent should not be more than twenty-five per cent of the whole force. Under this classification there will be the manager, superintendent, machine shop foreman (who will in most cases also supervise the forge shop), the pattern shop foreman, foundry foreman, one draftsman, one stenographer, one bookkeeper, a timekeeper, a shipper, and about twelve helpers or laborers. The line-up of the organization will appear something like the chart shown herewith.

Non-productive labor should be employed, whenever possible, on productive work. This class of labor may be used on such operations as drilling, bolt cutting, riveting, erecting or any kind of work that each individual may show ability to handle and in this way the overhead may be appreciably cut down. Men who show unusual proficiency in doing regular machinist's work may be advanced by degrees until they will no longer be required to do ordinary laboring work. The foreman can in this way help to train men who will be more likely to stick by the shop for a term of years than could be expected of the "floater." Many good machinists have started in as helpers and often have become the best men in the shop.

Mental Attitude Toward Apprenticeship

Some minds are prone to reverence that which is old or antique, others are readily attracted by what is new. It is an error to judge the past by the present or the present by the past. Machinists and tradesmen generally have in the past shown a disposition to think that the only way to learn a trade was by the slow and arduous method of "serving time." And this method was for many years looked upon as the only legitimate way for any one to become master of a trade and work for master's wages. Labor unions have in many instances dictated to the shop management to the extent of saying who should be employed to do machinist's work; and thus many men of fine ability who may never have had the opportunity to become machinists through the apprentice system could not be so employed. However, in recent years many shops have become independent of these organizations and can now feel more free to give any man opportunity to advance himself.

As long as a man can do a given piece of work in a satisfactory manner and assume responsibility for the job it should be of no consequence where or how he learned to do it. The main point is to get the work done, and the question of whether a man has served time or not deserves little consideration.

It is not my intention to disparage the time-honored apprentice or to discourage him in his ambition to become a good machinist. Many boys become discouraged and quit when they see boys who are not apprentices getting along faster than themselves, but it is a test of character not to become discouraged under adverse conditions and the boy who can go "through the mill" without protest is the one who comes out on top. Generally those who become disheartened and quit will be floaters all the days of their lives. The foreman can do much to encourage a boy and get him to see the other fellow's point of view.

The foremen in the jobbing shops constitute the foundation upon which successful management must build, for no shop can be highly efficient unless its foreman is of the proper caliber. Unlike the foreman in the manufacturing plant the jobbing shop foreman must not be limited in authority in handling help, and when it comes to hiring and firing he should not be subservient to any one. This is a point that may be open to criticism, for it has often been claimed that many foremen are not capable of using such authority with discretion and that much dissatisfaction and difficulty may be caused by an overbearing and unjust foreman; also that many foremen are in the habit of venting their petty spite upon employees who for any reason may incur their displeasure. Such men should not be employed as foremen in the first place, no matter what their practical knowledge may be, and if any trouble occurs from this source a change should be made.

It has been my experience that men prefer to hire out to the man under whom they are to work, and unless they do this they are not always sure just who is the boss and are more apt to shirk or do poor work. Of course it is necessary in large shops to make records and direct applicants to the proper foreman, but all matters pertaining to discipline and hiring should be under the direct supervision of the foreman.

It must be admitted that a foreman makes mistakes, but the above arrangement gives him the advantage of knowing each situation at first hand and he does not have to act upon the representations of others, as is the case when such matters are handled by an employment manager—who might make as bad a mistake as the foreman. The foreman should be made to feel that he is responsible for his department and it should be made plain by the management that he is considered worthy of this responsibility. He should be fair, firm, and fearless. Men have little respect for the "easy mark" or for the foreman who is afraid to enforce reasonable and just discipline in a frank and open manner.

Another important point to be observed by the jobbing shop foreman, and one that should be encouraged by the manager, is the pointing out of objections or errors that he may see in orders received from his superiors. By this practice many costly blunders may be avoided. A manager or superintendent often may be mistaken in regard to a foreman's ability, but the men rarely are, and they stand ready to boost or knock him accordingly. The majority of men will always require leaders and these leaders in addition to other qualifications should be able to exercise a proper restraining influence. The foreman should be a leader of men as well as a practical tradesman and he who hopes to attain proficiency in his career should devote some of his time to the study of human nature. This is the secret of the art of controlling men.

The Office Staff

Everybody is busy around a jobbing shop—or should be. The stenographer never gets a chance to powder her nose, for she may occasionally have to venture into the shop or foundry and return with a speck of grease or black lead right where the powder ought to be. And most certainly a jobbing shop office is not at all suited for the outfitting of a hope chest. Her duties are so many and varied as to preclude such unwarrantable disposition of her employer's time. She takes dictation,

types letters, bills and orders, and helps the overburdened bookkeeper on pay day! She answers the telephone, receives and interviews callers, gives first aid to the injured, changes the watchman's clock and investigates and smooths out complaints of customers. These are a few of the duties of the girl in the office and the successful aspirant to this position should possess not only tact and orginality, but some technical knowledge of the business.

In the same manner other office employees become accustomed to doing things ordinarily out of the usual routine of most offices. The bookkeeper is frequently pay master, timekeeper an all-around office man. The draftsman in addition to doing the regular drafting work may be called upon to fill in, in the absence of any of the others. The manager may occasionally be required to type his own letters and the superintendent may often have to take the place of a foreman who may be absent and carry on his regular work at the same time. Every one in shop and office must have a genuine interest in his or her work, and this interest should be kept up with enthusiasm and zest or the whole organization will lag and occasionally fall down on a job. Each individual must be prepared at all times to take up a task for which he or she was not specifically employed.

Good manners are not out of place in a machine shop. They include a proper respect for persons, places and things. Respect for persons should be apportioned with regard for age, seniority of service and skill. Respect for places may be shown by assisting to keep the shop clean and in order. Any shop may be made clean and attractive and should be kept so. Some men have respect for such things as tools and other people's property, but quite a few have not. It is well to observe the new man and make sure that he knows how properly to handle everything he has to use. The habits of mechanics are, perhaps, no better or no worse than those of any other class. The habits and manners of men, however, indicate in some degree their character and ability to appreciate good surroundings.

How Orders Are Received and Handled

The volume of orders varies from day to day and there may be days when no orders at all are received. They come in by phone, telegraph, mail, personal calls of customers, and soliciting. The most difficult orders to handle are those received by phone. Many orders are received in this way and a great deal of caution is necessary to have them recorded correctly as they are not always accompanied by confirmation in writing. Where orders are received in large volume, some system of numbering should be followed, as this makes it much easier to account for them in their progress through the shop and in billing them when completed.

All systems should be as simple and as flexible as possible and designed to eliminate all unnecessary work. Small blank pads with sheets numbered consecutively are useful for recording first drafts of orders and establishing the permanent order number. The first rough draft for an order should be put down immediately, with careful attention to customer's name and address, important dimensions, references to drawings and any other information that may be deemed essential. If more elaborate details are needed they may be incorporated in the shop order, which will bear the same number. When orders are taken over the phone they should be read back with special care to have all important details correctly understood. It is also good practice to have all such orders confirmed in writing and thus relieve the shop of responsibility for errors. It is well also to obtain the name of the person telephoning the order, for it is not uncommon to have these orders sent in by some irresponsible person who does not appreciate the value of accuracy in such matters.

As an illustration, suppose the Blank Paper Mill calls up and says: "We are sending you today, by express, a 60-in. pulley to be bored and key-seated. Bore, 4⅞ in., key seat, 1x⅝ in." That is precisely the information that will appear in the order and it is very important to write the dimensions correctly and read them back for confirmation. Quite frequently a job that may appear very simple and unimportant, as in this case, involves considerable risk. Suppose the pulley should have been 4⅞ in. instead of 4⅝ in.? Well, if a million dollars worth of paper mill is shut down waiting for that pulley and it does not fit when they get it there is likely to be some fireworks and the shop is apt to lose one of its good customers and its reputation in the bargain.

Time Keeping and Costs

There are about as many methods and systems of time and cost keeping as there are shops, and probably no fixed standard for this work is practical. For the jobbing business the system should not be cumbersome or involve much red tape. It should be sufficiently flexible to allow any job to be done without it when necessary, particularly where a large volume of emergency repair work is done. A very simple system and one that can be used in the average shop was described by the writer on page 190, Vol. 53, of the *American Machinist*. By the use of such a system each man is his own timekeeper and the process of taking off time and billing jobs is materially simplified. It is desirable to have the system as uniform as possible and the same system can be modified for use in forge shop, pattern shop and foundry. In matters of time and cost keeping it is impossible to be accurate to the *n*th degree and it is a waste of time and money to attempt to do so.

Take this example as a case in point: A large jobbing shop in the paper mill region received from one of its customers, without previous notice, an old worn-out couch roll bearing a big tag marked "rush this." That was about three o'clock in the afternoon and the finished job must go on the first train out in the morning at 5 a.m. Castings had to be made and the foundry would pour off inside of an hour. The pattern for the heads was found and sent into the foundry and the last pound of iron from the cupola was poured into the mold. Meanwhile a machinist was centering a new shaft and getting ready the wood covering. As the proper wood was not on hand the foreman had to send out to the local lumber dealer for it. The bill for the wood was received a month later; the machinist worked overtime and finished the job about 10 p.m. The foreman who received the job remained until it was finished and took it to the railroad station across the back doors of his Ford car. With the assistance of the machinist the roll was placed on the express truck and the early morning train took it to its destination fifty miles down the line.

Now this job had to be done without thought of any system and regardless of cost. If the paper mill had been double charged they would still have been ahead

of the game, because every hour shut down would buy a dozen new couch rolls. The shop lost nothing by ignoring the system. This was a case where the foreman knew just what was wanted and he went ahead without the usual shop order; leaving the latter to be made out the next day, at which time the machinist who did the job turned in his time-card and material requisition. This is a sample of conditions that many jobbing shops have to meet.

Some shops make a practice of taking in any kind of work that is offered and others will accept only certain classes of work and do business with a special class of trade—generally the class that pays the best. A shop that does a business of three hundred thousand dollars a year cannot very well make a profit on a fifty-cent job and should not bother with it. There are many small shops of the "hole in the wall" type that are glad to get such jobs and the wise shop manager will refer such jobs to them. The fellow who is just starting in needs a boost and it always pays to be on friendly terms with competitors, large or small. You may occasionally want to borrow some tool or shop facility that the other fellow has and he in turn may want to borrow from you. It is well therefore to extend every courtesy possible, always with these contingencies in mind.

As the average shop is not in a position to pick and choose what work it will do, it is rarely possible to synchronize its various activities with the demands of its customers. It is the service feature which counts most and that which brings and holds good paying customers year after year. Very often these customers are exacting and unreasonable in their demands and look to the shop to take care of their every mechanical need. They often send in work without any, or with at least very meager, instructions and the foreman is expected to know what is to be done.

The shop manager may sometimes be tempted to try the impossible job—that is, one that is outside the capacity of the shop—and may be willing to lose money on it rather than turn it down or have it said that it could not be done. When the job is accomplished the shop gets the reputation for doing the most difficult work and many jobs that stick the other fellow are referred to it. The class of work that does not pay or obliges the shop to lose money should not be undertaken unless the shop is in a position financially to handle it properly.

Breaking Into a Job

It may be necessary at times to stop work on a half-completed job to favor a special customer. The job may have to be taken out of a large machine or it may be necessary to completely break up a set-up that has taken much time to rig. In such cases the question may arise as to who should pay for this extra work. Certainly it would be unfair to charge that time against the job so disturbed. Then it remains for the shop to stand the loss or for the favored customer to pay for it. Such extra time may amount to anywhere from half an hour to four or five hours and is often the cause of dispute, especially when the customer does not understand what had to be done to push his job ahead of another one.

It is generally considered fair to charge such extra time to the favored customer. It is well, however, to have it understood beforehand and set it out as a separate item in the bill. It is wise to avoid clashes with customers in such cases and thereby lose their good will, and an endeavor should be made to favor the best customers and at the same time not offend the lesser trade. The really big customers, like paper mills who have a great deal of emergency repair work, are generally willing to pay a good price for service, but they want their work when they want it and are sometimes ready to move a mountain to get it. They rarely complain about the cost if the job is right.

We cannot well discriminate in accepting or rejecting work from regular trade; even a job that is out of the range of the shop may be taken care of by farming out all or a portion of it. Jobs which require special rigging that is to be built in the shop at great expense and possibly never used a second time are not always profitable.

By way of illustration a case which came under my observation was the overhauling of a triple expansion engine. A price had been set on the job and when it came to the point of reboring the low-pressure cylinder it was found that the largest lathe in the shop was not quite big enough. It could have been done by rigging up a vertical boring bar with suitable drive, but that would have required considerable extra work for which the customer was not willing to pay. It was finally decided to send this part of the job out to another shop that could handle it and the first shop just barely squeezed through with a small profit. Had the vertical boring bar been rigged up the job would have been a loss.

Purchase and Use of Material

In any kind of business it is good practice to keep the inventory as low as possible consistent with the requirements of the business. Especially is this so in the jobbing business and particularly toward the end of the year or whatever time the annual inventory is taken. The advantage of a low inventory is to be appreciated from the fact that the jobbing shop is obliged by the nature of its work to purchase a great variety of supplies of special character in small quantities. Staple articles that are used the year round may be purchased in larger quantities and by contract. Iron, coal, coke, steel, shafting, bolts, nuts and other standard articles in daily use are purchased in the usual way. Those articles which have to be purchased over the counter and in small quantities should be purchased only in the exact quantity required. If they should be purchased loosely and without much attention to the amount actually needed there will soon accumulate a large stock of odds and ends that are seldom available for any purpose. These small items in themselves are insignificant, but in the aggregate may amount to a considerable sum of money which can never be recovered.

Many small items of special supplies have to be purchased regardless of price as it is impossible to anticipate the needs of the shop for such material. Purchases are often made over the phone, or by an errand boy who may bring back the wrong articles. In either case they may have to be sent back and, if there were no purchase order system in use, it would result in much confusion. Therefore some form of purchase order should be adopted and followed. All verbal orders should be confirmed in writing. There are so many occasions to order material in a hurry and without waiting for an order that if no purchase orders are issued much time will be lost in tracing bills and charging material to the proper accounts.

Old and salvaged material can be used to advantage

on many jobs; such material as odd pieces of shafting, bronze bushings, steel rails, structural iron, old pulleys and many other items that come to the shop and accumulate. An acquaintance with the local junk dealer is often a life saver for the manager and an occasional visit to the junk yards in the vicinity is of much value, for we can often find there serviceable material that can be worked into a new job. It happens occasionally that some material is hard to obtain or cannot be obtained quickly. In such cases the last resort is the junk dealer, who may have just what is wanted and at a low price.

It has long been the custom of jobbing shops to employ rather old and antiquated tools and machines. The casual visitor from the more modern shops is often amazed to find machines and tools that were in use in his grandfather's time and are now in a somewhat rickety condition. The old-timer is amused at the attitude of the "floating" toolmaker who blows in on occasion and stays just long enough to make a "stake" to get to the next town.

The "floater" is a well-known character in most jobbing shops, and does not stay long. Many "floaters" have worked in well-equipped manufacturing plants and like to boast of what they can do. They are all-around machinists in their own minds until they hit the old-time jobbing shop. They usually start in by knocking the "junk" and finding fault with everything in sight. Because they have not been trained to make the best use of adverse conditions they are useless timber around the average jobbing shop. The real jobbing shop man is of the type who whistles at his work and knows how to "baby" an old lathe to get something out of it. He can generally get by in any kind of a shop, while his brother from the automobile factory tool room finds it rather rough sledding outside of his element.

The "Old Time" Machinist

The question has been asked, "what has become of the old-time all-round machinest?' though I am not one of the real old school I have been associated for a number of years with jobbing shops and have a wide acquaintance among men who have spent their lives in the business. The "old-timers" are dying fast and it reminds one of the Grand Army of the Republic when it turns out on Memorial Day, as each year sees fewer faces. Still, others come to take the places and a goodly number learn the secrets of the old masters and work on the same old machines year after year. There are thousands of small jobbing shops scattered over this broad land and nearly every community has from one to a dozen such men, while the large cities have more in proportion.

I remember an old shop I found in New York City only a few years ago. It was located in a basement and lighted with gas. There was an old lathe with a chain feed, and one of the men was finishing a piston ring for a marine engine. The lathe would surely have been a curiosity to any museum. The rest of the equipment was of about the same character. The proprietor said he was making money in spite of the high rent he was paying at that time.

The old-time apprentice system seems to have died out except in the manufacturing plants, in which mechanics are turned out much the same as they turn out sewing machines or typewriters—factory made. The jobbing shop has lost patience with the boy and the main reason is that boys now-adays are unwilling to work for the small wage that prevailed in the old days of the apprenticeship system.

In the time of my apprenticeship I received the munificent sum of 8c. an hour the first year and 12, 16 and 20c. an hour respectively for the three succeeding years. In these times it is difficult to find a boy of any ability who is willing to start for less than 20c. an hour, and under this condition it is often more profitable for the shop to give any man who is employed as a helper the opportunity to do machinist's work. Many helpers show good mechanical ability and are anxious to take advantage of opportunities. They, being more mature in years, will make more rapid progress in the work than a boy, and will show a greater capacity for responsibility.

I have known many helpers to become excellent mechanics, with proper guidance, and think that any man who shows mechanical ability and a genuine interest in the work should be given every encouragement to make a success. Some may call this "stealing" the trade, but it is not exactly stealing in the ordinary sense of the term. The man who is smart enough to steal a trade will make just as good a mechanic as the boy who, just out of school, expects to receive a man's wages on the start.

Still, there are quite a few boys working faithfully and in earnest in jobbing shops and who appreciate the opportunity to be there. What the jobbing shop will do for a boy is to make him resourceful and train him to become accustomed to meeting adverse conditions, an accomplishment which too few of us have these days. Unconsciously a certain resourcefulness and originality is developed that the big manufacturing plants cannot give, for the reason that when the boy in the jobbing shop is handed a job that is unusual he generally has to "dope" out his own way to do it, while, the boy in the manufacturing plant has about everything handed to him with a spoon and has to do his job according to a system laid out by someone he perhaps does not even know. And so it is that the boy who learns his trade in the jobbing shop has the advantage over the boy who graduates from the factory system. Jobbing shops now seem to be fast getting away from the apprenticeship system and the boy who is fortunate enough to get into one should early appreciate it and stick it out to the end.

Why the Jobbing Shop Is Not Easily Sold

It is not easy to sell new tools or machines to jobbing shops. Salesmen come and salesmen go, but few leave their wares. As a rule they fail to get the point of view of the owner or manager and probably get the impression that he is behind the times or an "old fogy." A salesman may be selling a good lathe, for instance, a lathe that will pull a heavier cut than any lathe in the shop and at double the speed. Undoubtedly it is a good lathe, but in consideration of the price the boss decides that it will not show as good a profit as any one of his old lathes.

This is, in most cases, the reason why such shops still cling to their old machines and patch and repair them as long as they will hang together. A lathe that cost two thousand dollars cannot be allowed to lie idle for a week or a month, while one that has paid for itself years ago could remain idle indefinitely without eating its head off. Before the shop can realize a profit on a new machine it must pay for itself, and as the jobbing business is so intermittent in character the process of

making a high-priced machine pay for itself is slow and uncertain. It is not because the more modern machines are not better or will not do more work, but rather that they will not always earn their salt in the jobbing business, that they are not readily sold.

Some managers and superintendents get discouraged and quit because of the equipment which they think should be entirely replaced. They, like the toolmaker, are not in the habit of making the best use of what they have. The owners of jobbing shops are usually a pretty hard-headed class of men, the "I'm from Missouri" type, and some of them even refuse to interview a salesman in any line. One man of my acquaintance, now in his eighty-sixth year, is the owner of a large and prosperous business and is rated at a million dollars. Most of the tools and machinery in his shop would be classed as junk if they were to be sold. There is one particularly old lathe in the shop to which the proprietor points with pride as one he worked upon himself when a boy more than sixty years ago. This lathe is still doing service, but it takes a real mechanic to do a good job on it.

Hours Constituting a Day's Work and Wages

Eight, nine, ten and twelve hours make a day's work, depending on the location and the nature of the business. In city shops eight hours seem to be the rule while in small towns, nine and ten hours still prevail and in out-of-the-way places like paper mill districts and lumber camps, twelve hours are not uncommon. The eight-hour day has grown so much in favor that it is difficult to get men in shops that work ten to twelve hours. It may be said, however, that these shops are few and far between. In the jobbing business nine hours, I would say, is about the average.

The number of hours constituting a day's work appears to be more a matter of opinion than fact. The authenticity of this statement is evidenced by the fact that men rarely refuse to work over-time, Sundays or holidays, when there is prospect of time and a half or double time. I have known a gang of men to work over-time until ten o'clock every night for six months in a shop where the eight-hour day was the rule. It is possible to pick a group of men for any arrangement of hours, providing there is an atmosphere of independence and the men are not bound by rules.

The hours in most shops are regulated by particular circumstances and the nature of the business. Consequently those shops that work ten or twelve hours will be able to do work cheaper than the eight- or nine-hour shop, other things being equal. In some localities where there are several shops, it may be found to mutual advantage to agree on hours and wages and also agree not to hire a man from one shop to another. This tends to stabilize conditions and surely will hurt none of them if they all abide by the agreement.

Future of the Jobbing Business

The jobbing business is destined to increase along with other lines and it is highly improbable that it will ever pass out of existence. Each year sees more and still more machinery added to the world's industrial wheels and this machinery will sometimes be in need of repairs. When business in other lines is brisk the jobbing business also should prosper, for it is doubtful that man can ever produce a machine that will not wear out or break down. Therefore the field for the wide-awake jobbing shop is practically unlimited. It is an interesting and absorbing branch of the machinist's trade and worthy of any man's best attention and study.

Trade Associations Need Not Fear to Study Costs

Trade associations or groups interested in cost accounting may meet solely for the purpose of the study of costs, the detection of errors and the improvements of their methods without contravention of law in the opinion of Commissioner Nelson B. Gaskill, of the Federal Trade Commission. Mr. Gaskill further believes that it is perfectly legal to make reports of such conferences available to absent members, government agencies and other interested parties.

This opinion was expressed unofficially recently by Mr. Gaskill in response to an inquiry from E. W. McCullough, manager of the Fabricated Production Department of the U. S. Chamber of Commerce.

"I have previously expressed my firm belief," writes Commissioner Gaskill, "that cost accounting is a legitimate trade association activity, and subsequent consideration has merely strengthened this conviction. Collective analytical study of the results of cost accounting furnishes an invaluable supplement to the individual cost accounting work. Comparison of results, analysis of results and the study and discussion of these results lead to the improvement of methods and the increase of efficiency. To prohibit collective study of costs for the purpose of their analysis, the detection of errors, and the improvement of methods, is to shackle educative progress.

"Of course the legal situation is confused by reason of the decisions in the Hardwood Lumber case and the Linseed Oil case, and it will be some time probably before this confusion will be cleared by any additional authoritative decisions. Trade associations must therefore determine as accurately as they can the legitimate field of proper endeavor and having so taken counsel, should, without hesitation, resting upon their legal advice and the clear consciousness of the propriety of their efforts, proceed without fear, willingly inviting the test of the courts' consideration of their conduct.

"I cannot find any reason for believing that the activities as defined by your questions are *per se* illegal. They may become so of course, if coupled with the use of other practices directed toward an unlawful end. But it is to be observed that a course of conduct lawful in itself, does not become unlawful merely because it may be used to accomplish an unlawful object. A course of conduct lawful in itself is judged by its results or by the intent with which it is used. Prior to the appearance of an unlawful result the unlawful intent must be so clearly manifested that the unlawful result is forecast as a natural and proximate consequence before the conduct can be condemned. A lawful course of conduct therefore may not be condemned by presumption of an unlawful intent when an unlawful result must first be presumed in order to deduce from it the unlawful quality of the intent which guides conduct.

"A trade association activity conducted strictly in accordance with the terms of your questions seems to me to stand clearly revealed as a legitimate activity directed to a lawful result. My answer to both your questions would therefore be in the affirmative."

Efficient Maintenance

By George Walter
In charge of Maintenance Department, Millholland Machine Co.

During some few years of experience in maintenance work in shops and factories almost from coast to coast, I have found many and varied forms of cornering the repair bill on the monthly expense account sheet. During the period of depression which manufacturers have experienced of late, overhead expense has assumed greater importance than ever before. This expense account has determined in many plants whether the workers should report one or six days a week or at all. The repair bill has been declared the hardest of all to corner and the most important. Slack time is the right time for repair work if it can be afforded. When business is in full swing it invariably interferes with production.

It seems to be the custom in most shops to place maintenance work in from three to four departments, electrical, machine repair, millwright and carpentering, each with its individual department head. Usually these department heads are responsible only to the factory superintendent or manager and often work in discord with one another. A big repair job may come up including work in all departments. Work drags and inquiry brings unsatisfactory answers. A mechanic when questioned is apt to reply that he "was waiting for the electricians to get out of the way," or "the carpenters haven't got the scaffold built yet." When such departments are separated it is always easy to pass the buck and the expense account may show a bill of repairs in labor alone amounting to as much as the original cost of the machine itself.

Another leakage in this department is in keeping tab on the time of the men in their work. A foreman in charge of a job may find he has more men than he needs and another foreman is short. He sends one of his men to help the other out and dismisses it from his mind. Unless the man checks out at the clock and goes home no one seems to know just how to account for his time. Foreman Jones says he turns his time in to Foreman Smith. Foreman Smith says he was helping Foreman Jones and the office knows no more about it than it did in the first place.

A Practical System Free From a Mass of Detail

A system which I have seen tried out and which I believe to be entirely practical in any shop however large or small provides for the combining of all departments which have in any way to do with maintenance under one head. Unlike many of the modern efficiency systems it does not involve a mass of detail and does not require a college education to keep the records which, although exceedingly simple, place the office in a position to know at any time just what it is costing for repairs, upkeep, etc. For instance, the cost of repairs on any given machine for a certain period of time may be ascertained within a very few minutes or the actual time spent by any one man on such work may be found recorded.

For larger shops two card index files are required for the keeping of these records but in the small shop one card index and an ordinary cash book will be found sufficient. The first step, however, is that the new department head become thoroughly acquainted with his shop, it also being understood that he be a man with at least some experience in each of the various lines of work over which he is to have charge. He should be able at all times to decide which may be the right or the wrong way to do a piece of work if a question arises.

The matter of records is simple. The cash book is double numbered, giving ample space for the recording of all repairs. The shop having been divided off into sections and each machine having been given an individual number, these numbers should be recorded on the corresponding pages of the cash book. For example, the first two pages numbered 1, may be headed, "B & S. High-Speed Tool Grinder," the third and fourth pages, numbered 2, "16-in. Bradford Engine Lathe," etc. The record may be kept as in Fig. 1.

NO. 4 MILLHOLLAND TURRET LATHE

		Time H.	M.	Rate	Cost
Dec. 2	Repaired clutch on countershaft By Millwright		30	0.60	0.30
Dec. 3	Repaired pump on machine By machine repairman	2	30	0.60	1.50

FIG. 1—PAGE OF REPAIR RECORD BOOK

Keeping check on the men's time requires only that each man report to the head of the maintenance department immediately before going to a job and after completing it. His time may then be filed in the card index for future reference and in case the job should be repeated an estimate can be made in advance. These cards may be made out as shown in Fig. 2.

Dec. 2, 1922
A. R. Jones, Millwright

	Rate
Repairing countershaft No. 30 machine	2 hrs. 30 min
Repairing lineshaft sec. No. 5	5 hrs.
Rebabbitting bearings	2 hrs.
Belting up No. 102 machine	30 min.
Total	10 hrs.

FIG. 2—INDEX RECORD CARD

Detail of the work can of course be found in the machine repair record. This record should also make note of machine work done in the shop, giving shop number, etc., and amount of material used so costs can be figured to the cent.

Another feature is that each time a new repair is made the past record of the machine is before the chief. Should he notice that excessive repairs are being made on one part of some machine he will know at once that something is radically wrong and will be in a position to know what trouble to look for. If a belt broke several days in succession, might it not denote a binding bearing? How long might this belt break unnoticed if a record were not kept?

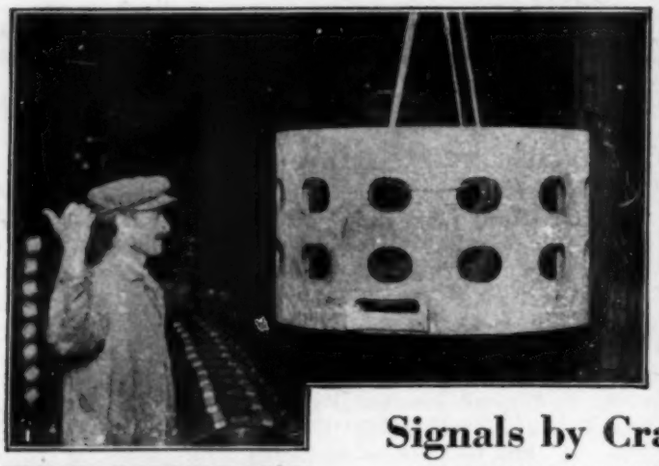
And, last but not least, there is someone to oversee the work. When it is time for the electrician to do his work the electrician is called and when his work is finished he is taken out of the way of the next workman. When the oilers have finished their rounds, instead of idling around the shop the remainder of the day they may be put to work where most needed. Maybe they will kick but it is the business of the head of this new department to secure men who will not kick. It is essential that he know how to handle men, the hardest kind of men to handle in the shop.

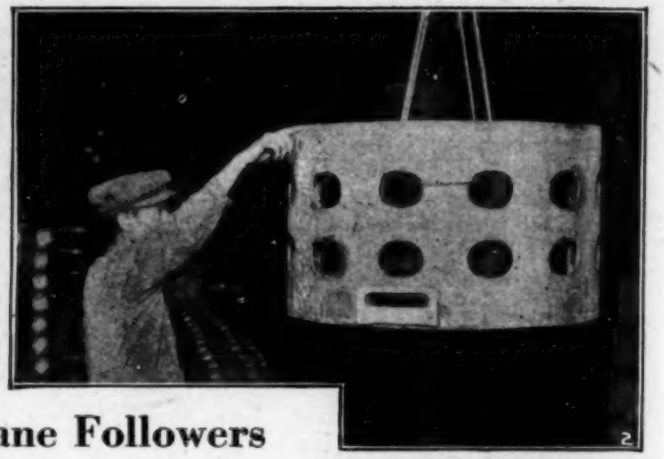
The job is no sinecure and is not one to be entrusted to a cheap man. A good man can save his salary many times.

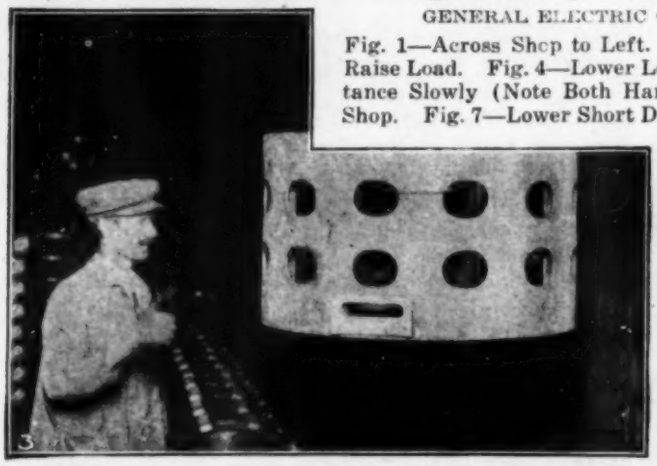
Signals by Crane Followers

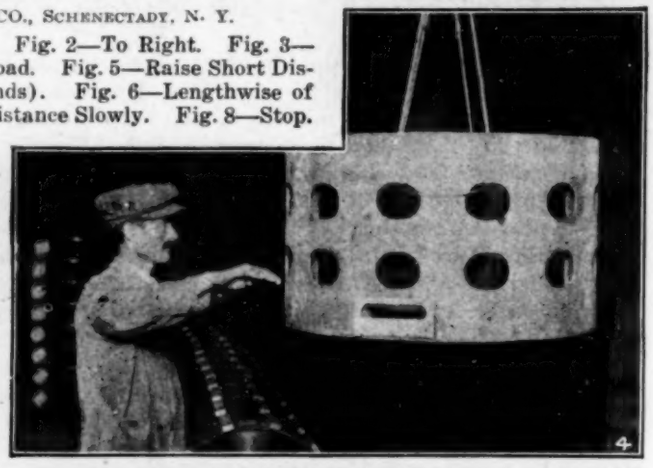
GENERAL ELECTRIC CO., SCHENECTADY, N. Y.

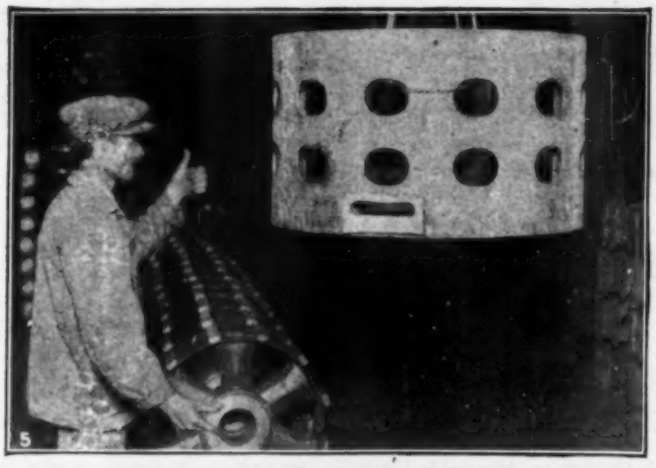
Fig. 1—Across Shop to Left. Fig. 2—To Right. Fig. 3—Raise Load. Fig. 4—Lower Load. Fig. 5—Raise Short Distance Slowly (Note Both Hands). Fig. 6—Lengthwise of Shop. Fig. 7—Lower Short Distance Slowly. Fig. 8—Stop.

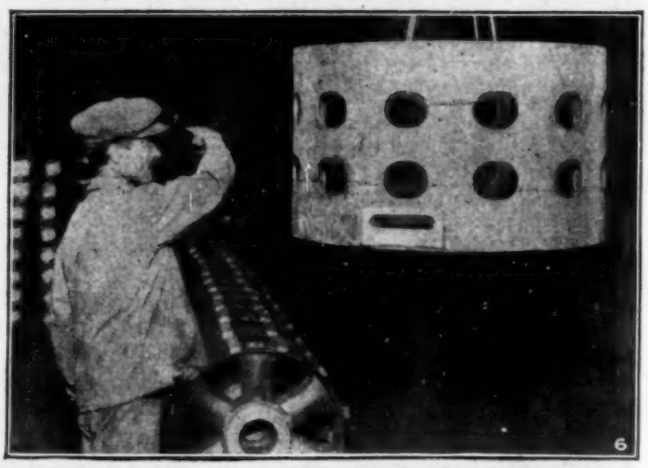


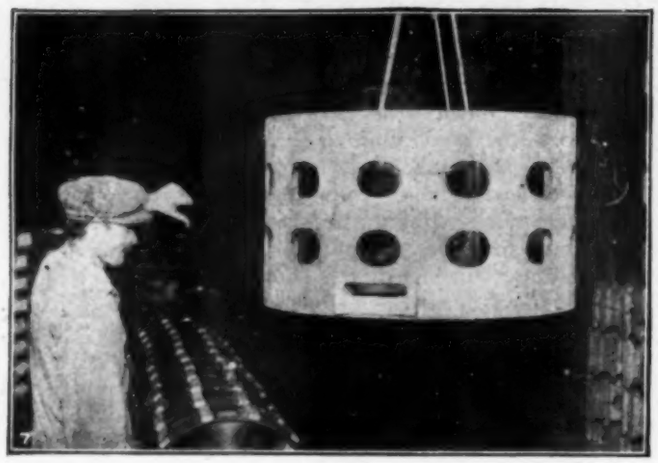


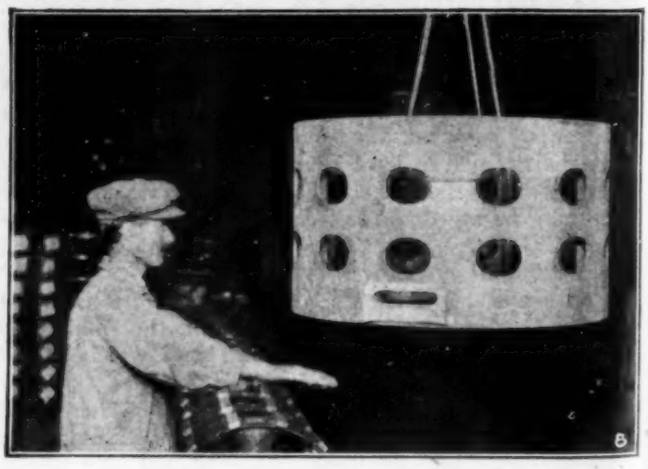












Which Management Engineer Shall We Consult?

A composite article in which twelve leading consulting management engineers tell what they can do to solve your management problems

AN INVESTIGATION of the business possibilities in 1923 indicates the existence of several cold, hard facts which loom up before the manager as immovable obstacles. The cost of materials is climbing slowly but steadily. The cost of labor will hardly diminish so long as unemployment is as scarce as it is today. Transportation charges are not likely to drop much and neither are taxes. An increase in the selling price of the product may easily bring on another buyer's strike. The consumer hasn't forgotten so soon how to bring that about.

What, then, is the hard-pressed manager to do? From our point of view his only hope of showing a profit lies in improving his methods. To realize his hope may necessitate the calling in of management advisers who are not so close to the job as he is.

The professional management engineer is still suffering from the discredit brought upon his profession by the flock of quack "efficiency engineers" whose principal efficiency seemed to lie in their ability to separate money from their clients. Most of these fakers failed to weather the business depression. The firms that remain are made up of reputable engineers with honorable traditions to maintain who can ill afford to make mistakes.

With the idea that the progressive manager will be glad of the chance to compare the claims and methods of the better firms without going to the trouble of corresponding with all of them, we have asked twelve of the best-known to state for the *American Machinist* the fundamental principles on which they base their work and the factors which have contributed most largely to their success. Their copy has been edited only where the number of words ran over our limit. Here is what they have to say:

Thompson & Worley

THROUGH the fog of misunderstanding and derision accumulated about the consultant in the days of the self-styled "efficiency experts," the sunlight of appreciation is beginning to penetrate, showing promise of a brighter day for the management engineer. Self-interest or sordid motives in merely "selling a job" to a client, as practiced by some consulting firms in the past, has unfortunately cast some discredit on the profession as a whole, but time has proved to these opportunists their own worthlessness and they have been forced to recognize the first cardinal principle of professional and personal ethics, "integrity of purpose."

The experienced consulting engineer unless a megalomaniac, can quickly determine whether or not he can be of real service to a prospective client, and once he has convinced the client of his ability to render service he should enter into the performance of his promise with his whole heart and soul, and at the lowest cost to the client commensurate with the services rendered. He must be able to contemplate his client's problems through eyes which are not blinded by self-esteem, and with a mind unprejudiced by preconceived notions or former experiences. He should be able to analyze and interpolate between the mechanical problems of the shop and the financial problems confronting the institution as a whole, otherwise he is unable to criticize shop methods intelligently, or to suggest an amplification or curtailment of the accounting machinery or the administrative organization. The consultant with the ability to visualize problems in two or more dimensions, is the only one properly equipped to fulfill the second cardinal requisite, "knowledge of his job."

Co-operation Better Than Antagonism

It stands to reason that a manufacturer even in a plant with mediocre equipment and with indifferent management, will have learned at least some of the fundamental truths regarding his business. His opinions, therefore, should never be dogmatically overruled, nor his methods upset without mature deliberation and, wherever possible, sympathetic co-operation with the operating force. Likewise, the engineer engaged in building a new operating organization should utilize all the good human material at hand, and once having built it, withdraw gradually so that his final departure will never be noticed. And when engaged in the installation of a production control system, or a cost system, or a general accounting system, it is a wise consultant indeed who will depart from a rigid installation based upon his experience in other plants, to conform with local prejudices or preferences.

Any system without flexibility, or without the ardent support of the operating organization, is doomed to failure, as is also the system which is too elaborate for the plant in which it is installed. The consultant who can show a sympathetic understanding of the problems which confront him, and particularly of his fellow men, is most effectively equipped for his work. This, the hardest attribute of all to define, is the most important that the consultant can possess. It can only be labeled by a very common word of very rare possession, "judgment."

To summarize—the consultant to be a success in his profession, must be a man of integrity, a man of experience, and a man of judgment. He must also be many other things, but above all, he must be a regular human being.

Scovell, Wellington & Company

SINCE 1910 this organization has fostered and developed the ideal of constructive service in Industrial Engineering and Accounting. This service, conducted from five conveniently located offices, embraces:

Industrial engineering, which develops organization plans, improves factory layout, methods and operations, organizes production planning and control, and betters labor relations—all resulting in greater efficiency, reduced costs and increased profits.

Constructive accounting, including the design, installation and revision of cost systems, and the reorganization of accounting and office methods.

Tax service and general accounting. Federal, state and local taxation is so heavy that business decisions cannot be made to the best interest of all concerned without considering their effect on taxes. We have, therefore, in each of our offices, men who are devoting all their attention to tax problems of clients.

Three special aspects of our constructive service are worthy of more detailed description at present. The first of these is our cost accounting service, which has been conspicuously successful. It is thorough; provable with the general accounting of our clients; intensely practical in operating details, such as labor and material reports; and distinguished by logical and original methods of analyzing and applying overhead or burden.

Besides this service for all kinds of business enterprises, we have devised and installed uniform cost methods in the plants of members of eighteen prominent trade associations. In the majority we have used a pre-determined or *Standard* cost basis, showing each month the differences between standard and actual cost; and, by establishing the reasons for variances, we have eliminated or minimized production losses.

So far as we know we were the first to formulate and put into actual practice the theory of a *normal burden* charged to cost or product, and, in periods of curtailed production, *unearned burden* charged off entirely outside of current costs.

Combined financial and industrial audits constitute the second feature. The combination, in one organization, of industrial engineers and certified public accountants, is of greater importance today than ever, for manufacturers are confronted not only with current financing but also, because of the difficulty of such financing, with the engineering problem of reducing the need for it by increasing the earning power of the assets. This can be done:

1. By reducing the cost per operation and per unit of production, through proper control of production and purchases.
2. By reducing the inventory to the lowest practical basis, through having it well balanced.
3. By improving the executive control of the business, and
4. By increasing the efficiency per hour of every man, machine and facility.

The financial audit is needed today, but even more so is the industrial audit. With our joint organization we often make a *combined* financial and industrial audit, to place before the manufacturer a critical analysis covering financing, manufacturing, sales and costs.

The third important service consists of the reports for executives which result from our constructive service. They are:

Prompt—news, not history.

Accurate—giving a true picture of the conditions of the business.

Clear—easily understood and readily explainable to factory men whose work is being judged.

Sufficient—inclusive of all details essential to successful operation.

The appreciation of the industrial helpfulness of constructive service has attracted to our professional staff accountants and engineers qualified by training and experience to deal with industrial problems. Furthermore, our policy of maintaining a staff *permanently* enables us to give maximum service.

G. Charter Harrison Associates

THIS organization, which is an association of accountants and engineers, specializes in the design of scientific systems of cost predetermination. Under the methods developed by G. Charter Harrison, founder and head, all data relative to cost variations are brought to a focus on a Summarized Operation Efficiency Statement which gives a comparison of the total actual and predetermined or standard costs for the period, and then analyzes the variation from standard according to the causes underlying these variations as for instance:

Idle time due to lack of orders.
Idle time due to other causes.
Variations in the price of supplies.
Variations in the quantity of supplies used.
Variations in the salaried staff.
Variations in the rates of salaries paid, etc., etc.

This Summarized Operating Efficiency Statement, which is supported by detailed subsidiary statements, shows increases in costs in red, and decreases in green, and thus instantly draws the attention of the executive to unfavorable conditions. It is analogous, in fact, to the railroad semaphore, which symbol has therefore been adopted as the trade mark of this organization.

The cost engineering methods developed by G. Charter Harrison have been somewhat fully described in his book "Cost Accounting to Aid Production," published by the Engineering Magazine Company. The analysis of cost variations by causes is accomplished by the use of a series of cost formulas which render the analysis of cost variations a matter of simple routine so that the most complex cost situations can be analyzed by the ordinary grade of office help.

A special feature of the service of this organization is that of presenting all plans in complete diagram form, these diagrams illustrating the routine involved in the introduction and operation of the system, commencing with the figuring of the standard or predetermined costs and working step by step to the use of these standard costs in obtaining daily, weekly and monthly efficiency data, current costs, and monthly profit and loss statements. These diagrams are drawn up in such complete form as to enable the work of installing the system to be accomplished by the client's organization with little if any further supervision, and it was by the use of such diagrams that Mr. Harrison was enabled to introduce his methods in England in the factory of Rolls Royce, Ltd., with a total expenditure of his personal time of only six weeks.

The methods which are introduced by this organization are based on the principle of exceptions—considered from the standpoint of enabling the executive to use his time to the best advantage. They follow the idea expressed by George Horace Lorimer in "More Letters from a Self-made Merchant to His Son":

In the first place, you don't need to bother very much about the things that are going all right, except to try and make them go a little better; but you want to spend your time smelling out the things which are going all wrong and laboring with them till you've persuaded them to lead a better life. For this reason one of the most important duties of your job is to keep track of everything that's out of the usual.

These methods in effect represent the application of the scientific management idea in the field of accounting—they result in closing the breach between the engineer with his daily need of standards, and the old time cost accountant who viewed costs in the retrospective solely and who was interested only in records of past performance expressed without relation to standards.

Ernst & Ernst

OUR service has to do with the management and control of business, with finances, accounts and costs and the organization and method incidental thereto. It covers the field of planning, production, inventory control, cost accounting, financial accounting, budgeting, market analysis, business graphics and the mechanics of accounting and record keeping.

It has for its object the development of method to obtain accurate knowledge of facts and figures, for the control of business in all of its elements; and to place in the hands of management the essential information for making competent plans and the necessary tools for making the plans effective. Any undertaking, whether it involves the installation of a cost accounting system or the establishment of a plan for making a market analysis, is approached with the purpose of making effective a method devoid of red tape, that will function readily, and develop accurate results.

We recognize the following fundamental essentials that must be present in our own and the client's organization:

1—That the essential machinery of business is competent organization. This means the selection of men and women, endowed with intelligence, suited to their work and equipped with a system functioning at all times along straight lines.

2—That facts are the basis of all science, figures the basis of all business and, therefore, that *facts and figures* are the bases of the science of business.

3—That the expansion of our activities and the quality of our services can only be as rapid as the finding of men of character and ability available and trained to do the work.

4—That this service must be constructive, that it must build up rather than tear down, it must retain if possible all old employees instead of introducing new ones to the organization, thus putting to the best use all the man-power and material available within the client's organization.

5—There are no two people in our own organization related to each other, and no place in it for the man who nags; nor is there any room for the egotist.

6—Training and encouragement of younger men is an essential; overlooking their minor shortcomings and developing their latent talent to the utmost.

7—Development of real team work while encouraging and recognizing individual effort.

8—Possession of a library in which is contained, and readily available, the accumulated experience gained to date in a practice covering twenty years; also the best literature on the subjects in which we are interested.

9—Close adherence to standard practice developed by competent staff members whose activities have extended into many different lines of business in the principal business centers of the United States. This is accomplished through a clearing-house functioning in our New York office that keeps in constant touch with all members of our system staffs wherever located.

10—We adhere strictly to the principle that all accounting should be controlled—particularly cost accounting—and that the general financial books should reflect at all times the results developed in cost accounting.

A. L. DeLeeuw

CONSIDERING that every industrial enterprise contains the elements of men, equipment and system, I divide my attention equally among these three.

As to men, I consider that foremen, superintendents, and other executives who have been with an establishment for some time and who have absorbed a great deal of knowledge essential to the running of the plant should not be displaced except in extreme cases and that, if they should prove to be deficient in some respects, it is better to instruct them and if necessary to give them assistance than to lose their accumulated knowledge and at the same time their loyalty. In short, whatever new features there are in a system I introduce must preferably be carried out by the existing organization and with a minimum of changes in duties.

In introducing a system of wage payment, I consider these three things essential: that there must be mutual justice between employers and employees to the fullest possible extent, that the men should be placed in a position where they can give their full effort to their employer, and that no man should work so long or so hard that he is not equally fit the next morning. I further consider it of great importance to study the men's capabilities and to allow them to work at tasks to which they are specially adapted.

It is my experience that, as a rule, equipment is not used to the fullest possible extent or to the best advantage. This does not refer to machinery standing idle for avoidable or unavoidable reasons, but to the fact that the capacity of machinery and equipment is generally underestimated and that even thoroughly practical men hesitate to change the existing practice and try new methods. For these reasons my first attempts at betterment are usually directed toward the more complete use of existing equipment, supplementing it, perhaps, here and there with some inexpensive accessory. I have found that the attempt at obtaining better mechanical methods awakens the interest of men and executives and gains their co-operation, so that many later improvements can be credited directly to the same men who heretofore were adverse to any change.

As a system, I make a sharp distinction between system of control and what might be called "paper system." Though orders, instructions, time-records, etc., require a certain number of forms and a certain amount of clerical labor, I aim to reduce the paper system to the lowest possible limit. First, because it is a burden; and second, because it always arouses the antagonism of men and often of executives. However, I insist on keeping the fullest possible records of improvements made and of methods established, and wherever possible I give clean-cut instructions as to the work to be done, but without insisting that the men shall follow these instructions if they find a way which

is better in general or perhaps better adapted to their personality.

Finally, in introducing new methods and betterments, I insist that the work introduced shall be self-sustaining at the earliest possible moment and that the extension of this betterment work shall be carried by the profits made by that part of the system already introduced.

Miller, Franklin, Basset & Company

OUR JOB is to reduce the cost of making and selling a product. To do this, it may be necessary for us to do some or all of the following things:

1—Reduce the material cost by reducing waste and spoilage or by finding less expensive materials.

2—Find better and faster ways to do work.

3—Set standards of production and devise wage incentive plans.

4—Arrange machines and departments in order to expedite work, reduce the number of employes needed and cut down the movement of materials.

5—Devise a cost system which will indicate where costs are too high, and why.

6—Devise a method of planning production which will reduce idle time of men and machines, cut down the investment in goods in process and speed up the flow of work through the shops.

7—Reduce clerical work in offices.

8—Recommend better methods of selling.

The policies and principles that guide us in our work are as follows:

1—Any method must be devised to fit the exact needs of any given shop. No two shops, even in the same industry, are exactly alike; therefore no two can safely use exactly the same methods of planning, of cost accounting or of anything else. There is no method that is universal. We have no pet methods—no fads—that we try to force on any concern. Every problem is, we feel, a new one, which must be solved on its own merits, but which experience will help to solve.

2—Changes in methods and installations of systems should be done by those members of the manufacturer's staff who are best acquainted with the conditions and who will have to operate the new methods. If outsiders do all the work of installation, the client's people will not be fully acquainted with the routine and the system is too apt to fail when the outside engineers leave.

3—Our ability to devise new methods is due to wide experience—gained in more than 1,600 factories—which have taught us what methods are best adapted to peculiar conditions; and to the fact that we can give our entire time to studying out the best new methods, as we have no routine duties as do the client's regular employes.

4—We save time for the client by guiding his staff, so that false starts and mistakes in method and in installing the methods will be avoided. We know the short cuts. We act as advisers, consultants, guides and teachers.

5—The object of a business is to make profits; not to operate an ingenious system. Therefore, we believe that a system, or any bit of routine in a system, is not justified unless it saves money ultimately. For instance, it is foolish to pay a clerk $1,500 a year unless his work will save more than it costs.

6—Our men are chosen for four principal qualities: Technical ability; experience in the operating end of factories; an open mind; a tactful and pleasing personality. Our men go through a long apprenticeship under able supervision before they are allowed any discretionary powers.

7—All of our work is done under the supervision of a partner who is, of course, as anxious that a job be done well as is the client for whom we do it.

Dwight V. Merrick

I FEEL THAT "the factors which have contributed most largely to my success" are:

1—That I prepare the way by assuring each one who is to be affected that he is party to the plan and will be benefited by it.

2—That before establishing a standard condition or method of work I prepare the ground carefully, in order that changes shall not have to be made later in the standard condition or method.

3—That in working out standards of conditions or method on the basis of carefully prepared conditions, I make an exhaustive analysis of all pertinent factors.

With respect to "the fundamental principles on which I base my work," these are in part stated or implied in the paragraph above; but the following additional statement may be of value:

1—Confidence and co-operation of executives, foremen and workers must be secured by an explanation of the purpose and methods of work.

2—There must be a standardization of equipment and methods and the development of a smooth flow of work through a department before betterment work can be done which will be substantial and permanent.

3—Every machine and process must be studied with great detail before a correct method of co-operation and manipulation can be determined.

4—Persons must be promptly and accurately sized up with respect to their individual abilities and skill, and selected for various kinds of work accordingly.

5—Time study as a method of investigation must be conducted with great precision and care and the largest professional experience must be brought to bear upon the computation of usable standard times and rates.

6—Only the standard times and rates based on most painstaking time study are dependable and likely to be enduring.

C. E. Knoeppel & Co., Inc.

MORE AND more clearly, as the years pass, my belief is strengthened in the virtue of simple ways of doing things, as compared to complicated methods which are hard to understand.

In the matter of organization, for example, we work down to the under-causes. To us, "organization" means something quite beyond a chart on the wall, or a book of rules. It means studying individuals in relation to the duties to be performed. It means assurance that authority will go hand-in-hand with responsibility. It means preventing the sort of blame that shifts from one person to another when duties overlap, or when a gap is left between one department's activities and another's.

Late last autumn, one of our clients took me to task, good-naturedly. Said he, "There is one feature of your service which you do not emphasize enough—and that is your ability to handle organization work so that you 'tie up the loose ends' effectively." It seems to me that I never appreciated any compliment more than that one.

So, also, in developing closer executive control without demanding too much attention to details, executive control means to me something very real and very definite. It means reducing the number of persons with whom a high executive must confer in order to keep in touch with present and near-future problems—but with provision that any exception happening shall be brought to the executive's attention promptly.

Just as a general is no less in control at headquarters because he does not need to know the identity of every captain and lieutenant in each of the brigades along the battle line; so the business commander should not be burdened with non-essential facts.

I believe that once the administrative practices of a business have been set forth clearly and fairly, the executive control of that business can best be effected through "management by exception." By that, I mean, to provide for smooth-running routine, and leave high-executive attention free to consider and decide as to exceptions and emergencies whose treatment must vary from the "regular way."

I believe in simplifying business records to the limit consistent with accuracy, clarity and promptness. So, in administrative use of production figures and cost figures, and in relation to sales development. One set of records can be made to accord ample information for all concerned.

Contrary to some other men who have spent many years in active business management, I believe that the so-called "industrial" enterprise is not necessarily different from the enterprise called "commercial." In a commercial business the buying function is raised to increased importance, as compared with the industrial business where it is naturally subordinate to production. But so far as the finance and sales divisions of any business are concerned, the delivery of finished stock by the manufacturing division is scarcely different from the delivery to stock-rooms of finished goods bought from another source.

In America, where the functions of production and sales are customarily handled by a single firm or corporation, it is possible *to simplify, while yet strengthening* the executive control.

As to factors contributing to our success: I would name, as all-important, our policy of concentrating upon essentials in order of their importance, and steering clear of everything that even remotely smacks of red-tape.

Wallace Clark—Fred J. Miller

THE TASK of the management engineer, as we understand it, might be divided into two parts:

First: to create or stimulate in the members of a client's organization a desire for better management and to help them to a clear understanding of the principles on which good management is based.

Second: to put into their hands the methods by which the desired condition can be attained.

Our experience has taught us that in beginning any installation it is better to build up from the shop rather than down from the top. Accordingly we find out what part of the shop is most in need of help and work with that foreman, helping him first of all to get a clearer understanding of his job and his responsibilities, to plan the work ahead of him, to report his plans to his immediate superior and the delays which prevent him from following them. We show the foreman how to use a simple method of recording the running of his machines together with the reasons for their idleness, and how to compare the performance of his workmen with the best standard he knows, at the same time finding out the reasons why a man has fallen behind.

In this way the foreman learns how to plan his own work and to make the best use of his equipment and knowledge.

When the training of several foremen in these methods is well under way, it is time to begin to co-ordinate the work of the various departments and plan the operation of the plant as a whole. This is done by introducing simpler and more effective methods where those in use do not serve the purpose for which they were intended. The methods of keeping stores are revised if necessary. The work to be done is covered by adequate instructions, and it is carefully planned, that is, materials, special tools and fixtures are ordered, and the necessary time of machines and operators set aside. The progress of work is watched and obstacles are removed. Cost-keeping methods are installed which give accurate information as to the cost of work done as well as the cost of idleness. Load charts are drawn which give executives a comprehensive picture of the work ahead of the plant, so that they can make their plans accordingly.

All these changes in methods are made in consultation with the members of the organization, and, because they have helped to develop methods to meet conditions, they understand that they are not bound by hard and fast rules but that, as conditions change in future, the details of their methods will have to be changed.

We have been able to secure results because we have secured the co-operation of the individual members of our clients' organizations. We have assumed that men want to make good on their jobs and that the plant cannot be well managed until we remove the obstacles which prevent men from making good.

Dwight T. Farnham—Irving A. Berndt

AN INDUSTRY to survive and play a constructive part in modern civilization—which is itself industrial—must be successful. That means that it must earn reasonable returns on the capital invested. Earning power depends first upon the wisdom of the entrepreneur who founded the business, because a business cannot succeed when there is no economic reason for its existence.

If the strategic position of a business is sufficiently sound to permit it to exist, the amount and continuity of its earnings depend upon its management. Management divides into three *classes*: I.—Financial management; II.—Sales management; III.—Production management.

In each of these classes two *functions* are exercised: I.—The administrative—which has to do with the determination of business policy. Successful business policy is based upon the collection and interpretation of facts. II.—The executive—which has to do with the effective motivation of the organization in the direction which the determined business policy demands. Executive control depends upon personality.

The success of the consulting engineer depends upon his realization of these facts and upon his ability to assist in increasing the effectiveness of all three classes of management. Personally I consider one of my principal assets my actual experience as an accountant, a

laborer, a foreman, a superintendent, a general superintendent of six plants, a salesman, a general manager, a director and a stockholder. This has made it possible to understand the viewpoint of all parties to industry and to recommend to clients only such methods of management as actually assist in increased earnings from the business.

The successful consulting industrial engineer must be able to analyze the whole business, to determine what is wrong and to effect the necessary changes.

In financial management the successful consulting industrial engineer must be able to analyze a balance sheet, to detect dangerous tendencies and to assist in their correction. He must be able to advise as to dividend policies, as to the investment of funds and must be familiar with economic and market tendencies. He must be able to assist in refinancing. Altogether he must so advise his clients that the maximum returns will be secured from the financial policy adopted.

In sales management he must be able to work out a competitive analysis of the product which will show just what must be done to increase the volume of sales and to increase the margin between costs and sales price. He must understand market analysis, the various methods of sales organization and must have sufficient knowledge of advertising to realize exactly what sort of technical assistance is required. He must understand the problems of sales management and of salesmen and must be familiar with the various quota setting and sales follow-up systems.

In production management he must be familiar with the various production control systems, with rate setting, with standardization, storage and purchase methods, personnel direction, committee organization, profit sharing organization, costs, in fact with every phase of plant management which bears directly or indirectly upon the reduction of manufacturing costs.

If the consulting engineer really knows the fundamentals of successful financial, sales and production management; if he is capable of analyzing each situation and of correcting it tactfully; if he will use common sense instead of systems and panaceas; if he will substitute personal service, character and integrity for slogans and aphorisms he will be successful. If he neglects these essentials he will only injure himself, his clients and his profession.

Arison, Goodwin and Associates

THE OBJECTIVE of modern production engineering is the development of methods and movements whereby the physical man may co-operate to the fullest extent possible with the mental man. The capacity of the physical man can be definitely determined, and is very limited. The capacity of the mental man has never been determined; his ultimate ability has no limit, provided it is encouraged to function.

The great pity of our age is that while the mental man has been greatly developed, the physical man has deteriorated in his mutual co-operative method. The physical man, relieved by the mental man of the necessity of putting forth the same exertion for the accomplishment of his aim, goes on expending the same effort as formerly, but inefficiently, because he has learned to call upon his mental brother only in cases of extreme urgency. What is needed imperatively today is to teach the physical man to enlist the service and help of his mental brother, so that effort and strength may be conserved to further nourish and co-operate in the accomplishment of greater achievement.

For centuries study has been intensively directed at the phenomena of nature, at the composition of the animate and inanimate elements which go to make up the earth and the world, at the chemical energy and forces of nature, and at the physical energy and forces of nature. Stupendous progress has been made in these directions.

The capability and development of the human element were overlooked, until within the last decade the effort has been made to determine whether the same results which have been attained in the physical sciences could not be reached out for in the study of the human element. The result has been that there is now a definite conception of the conservation of the physical energy of the human element through appropriate direction or supervision rather than by its masterful and wasteful expenditure.

Elimination of Waste by Co-ordination of Human Effort

The first principles have been established. The next step must be the education of the mass of humanity to an appreciation of the utility of the human element, and the co-ordinating of all human effort into masterful instead of wasteful purposes.

Our forebears, in the face of natural resources that appeared boundless, and with the main ideal of a bare existence uppermost in mind made tremendous sacrifices of material and effort. We have inherited their wastefulness and neglected their thrift. Our natural resources have become depleted to a point where, while the pinch does not exist, the shortage is apparently in sight.

Our development of the factory system of production, wholesale methods of distribution and tremendously competitive ideas of advertising and selling have brought about a tremendous burden of cost, so far as the ultimate consumer is concerned. The problems of advertising and selling and of distribution being the newest of all, we will undoubtedly hold on to them and find their solution more reluctantly than with the others. Efficiency having been for some time applied to matters of production, these will continue, undoubtedly, to receive the greatest amount of attention and probably it is in this direction that the greatest and the immediate gains may be made.

However, whether our methods for greater efficiency be applied to production, selling or distribution, we must, if we accomplish anything at all, keep in mind a clear conception of what efficiency is. To some it means the merciless speeding up and driving of men in direct violation of one of the fundamentals—the fair deal. To others it means absolute routine, which is never efficient and violates another fundamental—common sense. To still others it means loading pig iron on cars in time to a stop watch. These are all misconceptions of efficiency.

Efficiency results from the consistent practice of all of a few simple but fundamental principles. Like the laws of health and all other of nature's laws, while universally applicable, they work out into an infinite variety of detail in practice. In the long run, however, they all fall under one separate and indivisible classification, those laws and rules which in their application shape themselves along the lines dictated by common sense.

Harrington Emerson

FIRST find out what the actual conditions are, then find out what ought to be. What methods will enable us to attain the ideal and have we the character, competence and courage to use them?

Principles concern me very much, details much less although they have their value. Principles are happily few; details are without number. Therefore, recognize and apply principles, going to the very bottom. Do not build on sand! An important principle is that of proportion. Nature observes this principle and it holds good as to business as well.

It would not be possible for all of us to be producers or all to be manufacturers or all to be carriers or all to be sellers. There is a very definite and fixed best relation between the different industrial groups from producers to sellers.

There are only three elements in production: the equipment; the materials; the supervising human personnel. For these three the most economical proportions are fixed in each separate kind of business. There is also in each business an economically definite amount of justifiable investment for each $1,000 of average revenues.

There are more minute, longer gathered and classified statistics as to railroad operation than as to any other widely extended business. The various industrial principles can be illustrated by a study of general railroad conditions.

Transportation as a standard whole is entitled to about seven per cent of our national capital and to about the same proportion of our workers. Railroads are entitled to about two-thirds of the seven percent.

Railroad investment should not exceed two and a half times the average railroad operating revenues. If it does dividends fall off and receiverships begin.

Investment requires for its perpetuation a yearly allowance of between one-seventh and one-sixth of its amount. Even on an investment ratio of two and a half this requires for perpetuation at least forty per cent of the revenues. This leaves for operation sixty per cent, operating consisting exclusively of materials and of compensation expenses. The railroads as a whole are actually operating at about seventy-eight per cent and the ratio of investment to revenues is between three and four.

The relative standard proportions of railroad perpetuation expenses, of compensation and of material costs are 40, 40, 20, and these cannot be side-stepped without ultimate disaster. The actual relations are about 16, 56, 28. These out of balance relations could at once be rectified. There is no insuperable industrial difficulty. After the large principles are recognized and defined it is easy to correct details if courage and competence are there.

Owing to the completeness of the records railroads have been used to illustrate fundamentals which apply to all industry.

There are few businesses in which total producing costs could not be reduced twenty per cent.

I have always sought for fundamentals and then entrusted details to our specialists. The results have been satisfactory.

Automobile Insurance

In a report recently issued by the Chamber of Commerce, it is estimated that 12,000 people are killed and 325,000 injured annually as a result of automobile accidents. Naturally, the liabilities attendant upon the use and operation of automobiles have created a demand for insurance protection. The first insurance policy on an automobile was issued in the United States twenty years ago, but since then, particularly during the past fifteen years, there has been rapid growth in this branch of insurance. There are five general types of automobile insurance, namely, public liability, property damage, fire, theft and collision.

Public liability insurance, in brief, covers the legal liability imposed upon the insured for injury or death which may result to any person or persons through the ownership, maintenance or use of the automobile.

Property damage is a type of insurance never written separately. It covers damage to the property of others, except when such property is in the car itself or in charge of the owner of the car or his representative. It also covers loss of use of the damaged car.

Fire and theft insurance provide indemnity for these respective losses.

Collision insurance covers damage to the car insured, occasioned by its collision with some other object.

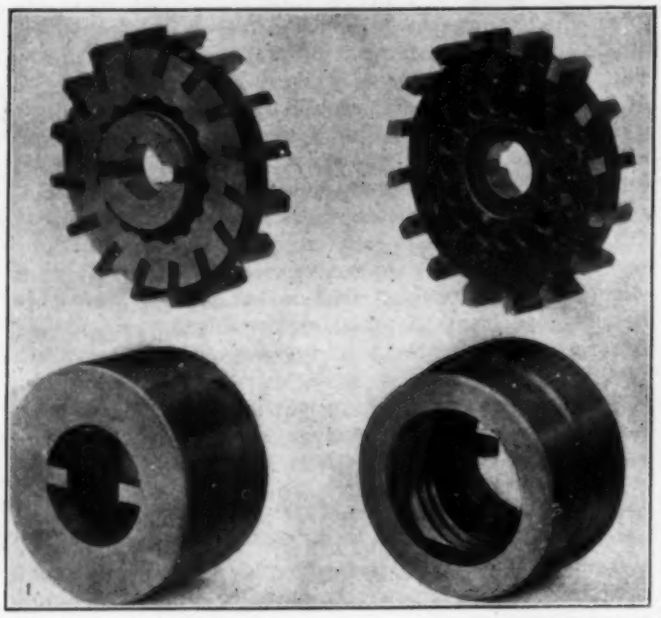
It is thus evident that the first two types of insurance named cover the owner's liability for loss which may result to some other party, while the other three indemnify him for damage or loss of his own car. As it is the object of this article to consider automobile insurance only as it protects against loss caused to others, the discussion at this time will be limited to the public liability and property damage policies.

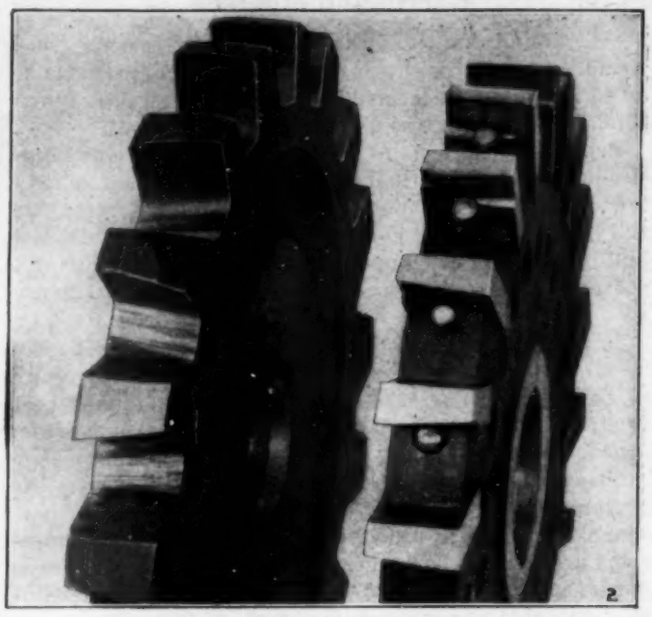
Public liability is generally considered to be the most important type of insurance to the automobile owner. The amount of damage which his automobile may cause to the property of others is practically limited, and fire, theft, or collision can entail no greater loss than the value of the car itself. On the contrary, an accident involving serious injury or death to others may result in suits against him which will wipe out his entire estate.

The standard limits for public liability coverage are $5,000 in case only one person is injured, and $10,000 in case more than one are injured in a single accident. Even in the latter case the maximum liability to any one individual is $5,000. These limits may be increased by the payment of a relatively small additional premium.

The general provisions of property damage insurance are similar to those of public liability. The following qualifications, however, are peculiar to this type alone. Property belonging to, or in charge of the insured or his employees is not covered; nor is loss by fire. The standard limit is $1,000 but may be increased by the payment of an additional premium. The indemnity, however, is always limited to the actual cash value of the property destroyed at the time of the loss.

Both public liability and property damage rates are dependent on the type of car, its motive power, use to which applied, and limits of liability. The population density, traffic conditions and past accident experience of the territory in which it is usually operated also influence these rates. It is of interest to note that an 8 per cent reduction is granted in the rate of a private passenger car used only for pleasure purposes, and a 20 per cent reduction, if in addition, it is operated only by the owner.

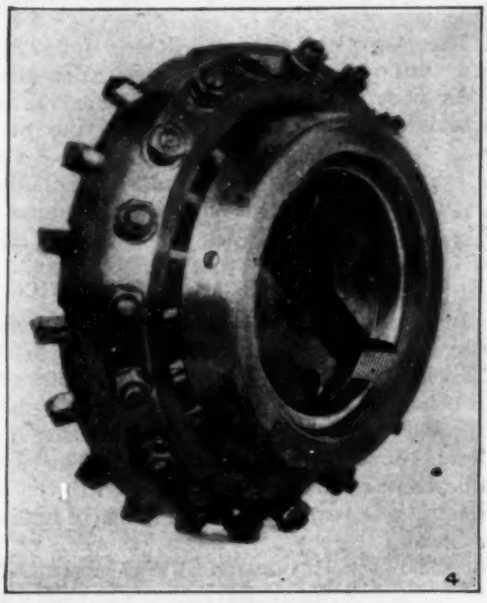


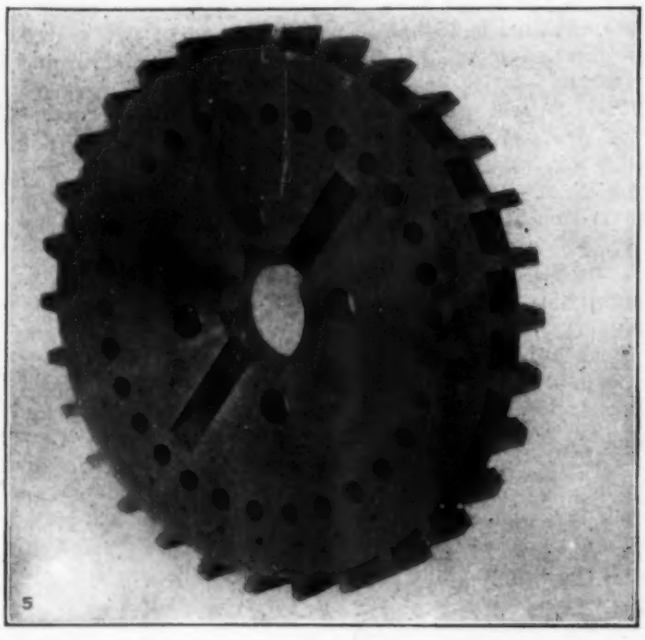


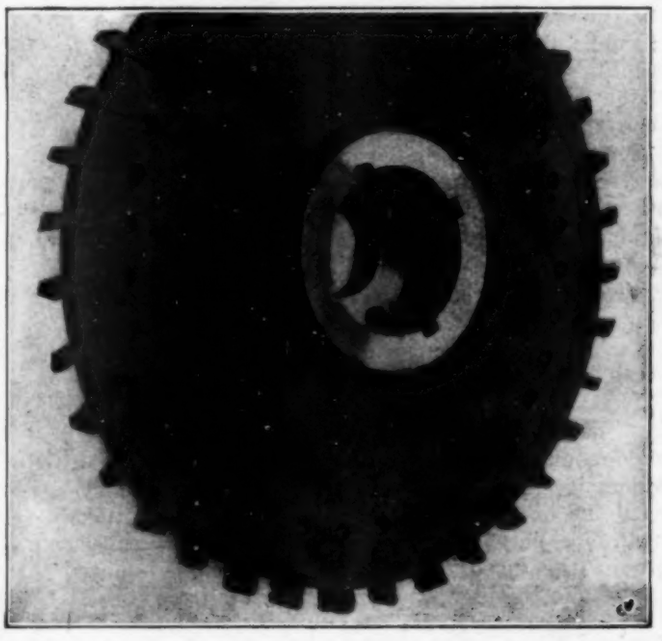
Milling Cutters

From General Electric Co., Schenectady, N. Y.

Fig. 1—Cutters and adapters. Fig. 2—Solid cutter removed 212 cu.in., the other 241 cu.in. nickel alloy steel. Fig. 3—Adjustable milling head, cutter and grinding block. Fig. 4—Back of same cutter. Fig. 5—Driving side of 10 x 1 in. heavy duty cutter. Fig. 6—Slotting cutter, 25 x 1.065 in.







What Kind of Training for the Foreman?

By B. M. NUSSBAUM
Vice-President, Business Training Corporation of New York

Two plans that didn't work—What the foreman needs—Making a study course interesting—Some of the results accomplished

TWO YEARS AGO the management of an important New England factory decided to give special attention to the improvement of its foremanship. The services of a learned specialist were called upon, and he was intrusted with the task of developing a training course that would accomplish what the management desired—namely, educate the foremen in the principles and methods of modern production, give them a grasp of industrial economics, and make them capable lieutenants of the management.

THE DAY of the driving foreman is passing. The foremen of today must be real leaders of men, capable lieutenants of the management. They must be trained not only in production methods but in industrial economics. The training, however, presents a real problem as they cannot be treated as school boys but must be handled in an entirely different manner Little can be accomplished with the usual text books—the real problem is to secure and hold interest in the subject. This article tells of plans that have worked well in many plants.

The specialist was a man who had considerable experience in college teaching, and he resolved to build up an educational work in that plant that should conform to the highest standards of collegiate training. He went about his task with characteristic thoroughness. He spent many months developing the course, consulting authorities in universities and technical schools, carefully selecting the formidable list of textbooks to be used, drawing up a schedule of lectures, and producing on the whole a truly remarkable course. It embraced mathematics, blueprint reading, physics, chemistry, and machine design, with a sprinkling of economics, sociology, civics, and psychology.

But the course was never given. When the first announcement of it appeared in the plant magazine, a committee of foremen called on the educational director and respectfully but bluntly informed him that, although they might be benefitted by the study schedule which he had arranged, they were really too busy to go back to school at their time of life. This ultimatum was a very humiliating one, but there was nothing to do but abide by it, for without the hearty co-operation of the foremen it was obvious that no plan could succeed. The educational director resigned shortly afterward, very much chagrined at his failure, but he had only himself to blame for it. He may have been a master of the science of pedagogy, but he was pathetically ignorant of the character of foremen.

In another factory, this one in the West, the same decision as to the need of foremen training was arrived at by the management. But in this case the management itself was doubtful of the willingness or ability of the foremen to study, and so it decided to organize a foremen's club and give the instruction in an informal way at club meetings through the conference plan of training. The theory was that by bringing the foremen together informally, and having a leader propose plant problems for discussion and stimulate the foremen to ask questions and express their own ideas, the principles and methods to be taught would get across.

But the club meetings didn't work out that way. There were two or three natural-born talkers who plunged into discussions, but for the most part the foremen sat around and just listened or pretended to listen, but their cooperation stopped there. Occasionally a warm discussion would develop, but usually it was about some trivial detail or some point of grievance. Soon the meetings settled down into bickering matches between the two or three who had a gift of gab, while the others idly listened, yawned, and watched the clock. As a method of training, the experiment rated close to zero, and was finally given up.

These two experiences illustrate two extreme views of the subject of foremen training. There are those, like the educational expert in the New England factory, who think of no training as worth while unless it comprises a curriculum as comprehensive, well-rounded, thorough, and authoritative as that of a technological course in some university or engineering school. And there are others who believe that foremen won't study, that any program calling for study will scare them off, and that therefore the training must be imparted indirectly, or homeopathically in small doses informally given under the guise of a sociable round-table chat. The two experiences cited illustrate also, I think, the usual result when these views are tried out on an ordinary group of foremen.

The truth of the matter is that study is necessary. Where it is desired to impart sound principles and instruct the foremen in the modern methods of handling men and getting out production in step with the plans of the management, some systematic study is necessary. The average foreman is not imaginative, and does not reason principles from cases. He needs his facts organized, laid out for him, and illustrated and explained in detail. To get the new ideas, he needs some systematic presentation of them that he can study and master.

It is also true that foremen will study if the right kind of study material is provided and if it is presented to them in the right way. This statement is proved by an experience of foremen training in more than six hundred industrial plants in the United States and Canada, where more than 30,000 foremen enrolled for the training. The records show that 80 per cent of these foremen continued through the three months of the course, studied the six textbooks required, completed the problems and exercise work called for and met all the requirements of the instructors.

Eighty per cent of 30,000 department heads is an impressive showing, especially when you consider that these men are not university students, accustomed to regular study, but are frequently of extremely limited education, most of them never having gone to high school, few of them even finishing grammar school, And yet, nearly 25,000 of these men, employed in industrial plants during working hours, buckled down to the job of studying in their spare time, followed through the educational program prescribed for them, finished the work satisfactorily, and in numerous cases the results of their training have been such improvement in the foremanship of their departments as to call forth the appreciative remark of their managers.

Among the companies in which these results were accomplished are such representative concerns as the American Steel Foundries, Cambria Steel Co., Carpenter Steel Co., Delco Light Co., Hoover Suction Sweeper Company, Hyatt Roller Bearing Co., Ingalls Shepard Forging Co., Landis Tool Co., John Lauson Manufacturing Co., Mansfield Sheet & Tin Plate Co., Midwest Engine Co., Miller Lock Co., National Enameling & Stamping Co., Niles-Bement-Pond Co., Oxweld Acetylene Co., Penberthy Injector Co., Rhode Island Tool Co., Simplex Wire & Cable Co., Standard Plunger Elevator Co., Staten Island Shipbuilding Co., B. F. Sturtevant Co., Taylor-Wharton Iron & Steel Co., Union Twist Drill Co., Warner Gear Co., Wier Frog Co., S. A. Woods Machine Co., Bridgeport Brass Co. In spite of the fact that these companies represent many varied industries and the manufacturing processes differ in numerous details from plant to plant, one standard plan of training has been used for all and for many more that might be named if space permitted.

Analyzing the Foreman's Job

The plan represents a careful analysis of the foreman type of man and of the foreman's job, with a view to balancing the training so that it will not only provide the fundamental information which it is necessary for a good foreman to know, but will also stimulate his interest and enthusiasm. The training plan is based on a recognition of the peculiar position which the foreman occupies. For to be successful he must be more than a mere technician; he must be a leader, the executive head of his department, and that requires the development of a personality and the providing of effective motives for leadership.

Most foremen are promoted workmen. They are usually raised to foremanship in recognition of their special ability in the work of the department. The result is that the average foreman is a skilled man in the work of his department, he knows the machines and the processes, and how to operate them. But his biggest job in the average industrial plant is to supervise and handle his men so as to get maximum results from their labor. That requires an understanding of human nature, the exercise of tact, control and leadership. How rare a thing it is to find a foreman who is also a successful manager of men. Every factory manager knows that such foremen are exceedingly scarce. They are so scarce that when such a man does develop in a department, he is speedily picked for a superintendency or some higher position where his executive gifts and leadership ability will be given larger play. And yet there is no position in the factory where these gifts and abilities are more needed than in the foreman, for no man comes in closer contact with the workmen and no man is more responsible for favorable relations among the personnel of a factory force.

The average foreman is one-sided in his development and his mental attitude and tendencies are also one-sided. The fact that he is a promoted mechanic or operative, with no training or experience in management, means that he thinks of factory problems and policies mainly from the point of view of the worker, and not from the point of view of the management. Without his support new policies, improved methods, changes in regulations, and other ideas of the management cannot get across fully to the rank and file. And yet all too often the foreman has no real understanding of, or sympathy with, the management in its innovations and stupidly blocks progress.

Some Foremen Block Improvements

"Many of the improvements, policies, and ideas of a company stop at its foremen," said H. L. Willson, vice-president and general manager of the Columbia Graphophone Manufacturing Co. "They are not transmitted to the rank and file of employees. The most patient study of operations and most scientific reorganization of working methods may be entirely wasted by the foreman who tells his men to 'fergit it' when the reorganizers are on the other side of the door. The smoothest and most successful production routines may be disorganized or smashed by the whim of a foreman who is ignorant of the working of the whole plant. The friendliest kind of relations between executives and employees, the most careful employment methods, may be wiped out and a high labor turnover piled up by a tyrant foreman. In every phase, at every point, the work of the executives may be made or marred by the foreman."

The foreman in the average factory department has three responsibilities:

1. To supervise the technical processes of his department with sureness and skill.
2. To handle the human factors in his department with the minimum of friction.
3. To co-operate with the other departments and with the general management in co-ordinaton of activities, improvement of process, elimination of waste, and all other efforts looking toward more efficient production.

Most foremen are already well qualified in the first of these duties. They are usually good technicians and at least know the routine of their departments and the accustomed methods of operation.

It is in the second and third functions that the average foreman is lacking; and of course one effect of this deficiency is to make his supervisory work narrow, mechanical and, to a large extent, rule of thumb. Weakness in the managerial function and the failure to appreciate his co-operative relation with the other departments of the plant, makes the average foremen a narrow routineer, deep in his own rut, with little understanding of his place in industry or realization

of the full responsibilities and importance of his position.

The right kind of training for foremen, therefore, concentrates on the second and third of the foremen's duties and treats only incidentally his work as a technical supervisor. As worked out in the industrial companies named, it requires four essential elements:

1. Text material giving the basic information of the course. This is necessary in order to fix the principles and methods taught, for the foremen must study, and in order to study effectively they must have properly organized material. To refer the average foreman to standard school texts is futile, however, for he is not trained to follow academic treatises. Specially prepared texts are necessary, and they must be written from the angle of the foreman's interest and in a style that will claim and hold his attention. This matter of properly organized and prepared texts is the first essential, and in fact the very groundwork of the training.

Personality of Lectures Vital

2. Lectures amplifying the text material and giving it close application to the problems of the individual plant. The lecturers also bring important personal qualities into the training and reinforce in a very helpful way the teaching of the texts. In some cases, where plants were remote from training headquarters, it has been necessary to dispense with this feature and to substitute group leaders chosen from the factory organization. But the best results have been obtained where lecturers were used to bring a personal message on each division of the course, to afford the foremen-students the opportunity of asking questions, and to direct and lead their discussion in conference meetings.

3. Problems calling for practice in the use of the principles and methods taught in the texts. The problems each present some typical plant or department difficulty, set forth all the relevant details involved and ask the foreman-student to draw up a plan of solution. For example; following up the study of "Handling Men" there will be sketched a departmental situation in which different types of men are employed, the outstanding characteristics of each man will be described, the dilemma outlined and then the student will be asked how he would go about handling each of these men in order to get the difficulties ironed out and the production back on an efficient basis. Each of these problems is based on a textbook of the course, and to solve it the student must apply the principles and methods taught in the text. The problems therefore not only provide valuable practice work for the foremen-students, but also give a means of checking up their study and knowing whether or not they are mastering the texts.

4. Group conferences in which opportunity is given for questions and discussions. Where lectures are a part of the training system, the group conference usually follows the lecture. Where it is necessary to omit the lecture feature, group conferences are held weekly or forthnightly, led by some executive of the plant or other member of the study group. Usually these group conferences develop considerable discussion. The men are full of questions and ideas stimulated in their reading and by the lecture, and the result is that the group conference assumes a reality that would surprise those who are accustomed to the usual attitude of silence and awkwardness that characterizes the ordinary meeting of a group of foremen.

These then are the essential features of a plan of training for foremen that has been tried in a great many plants. Of how successfully it has worked, we can judge best by the results as reported by plant executives and by the foremen themselves.

An executive of the Granite City, Ill., rolling mill of the National Enameling and Stamping Co., stated in a public meeting that production in all departments of that mill increased 34 per cent over the corresponding figures of the previous year, and the result he attributed largely to the better teamwork and improved individual ability among the foremen developed by their training.

An official of the Staten Island Shipbuilding Corporation said, in reporting the results of foremen training in his plant, "Our labor turnover has been reduced fully one-half during these six months, and we are constantly increasing our force with men who stick. We have worked up and installed many new wage incentive plans."

An executive of the Biddle & Smart Co., makers of bodies for automobiles, reported training results in his plant as follows: "In our production records we know we have had closer co-operation from the foreman during the past year than at any other time during the three years previous. There has been the will and the spirit to come across and this, as you know, counts for increased production."

In another factory the president stated that foremen training had had a very marked effect on the suggestion system which theretofore had been of little value. He estimated that the suggestions received through this department last year meant more than $100,000 to the factory in wastes eliminated and production increased.

Many definite records of results have been made, but necessarily a large part of the fruits of training are intangible. They cannot be measured in the cost-sheet, but they affect the costs as well as profit and loss in innumerable ways, none the less significant because indirect and invisible. Nor do the benefits of such a system of training cease with the ending of the training program. They continue a permanent factor in the life and operation of the plant and, in fact, generally lead to some form of continuation work which carries on in an organized way the spirit of improvement, of co-operation with the management, and of increased efficiency of operation and control begun in the training classes.

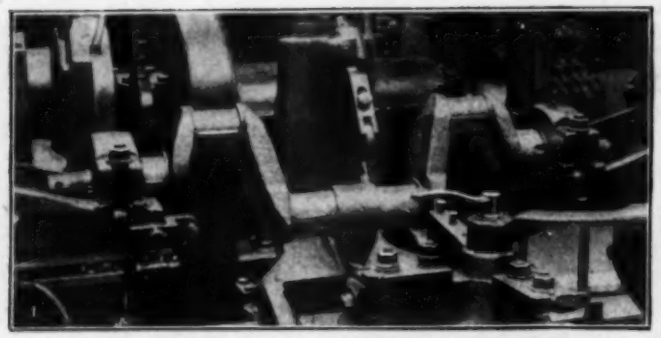
Machine-Shop Bulls—Discussion

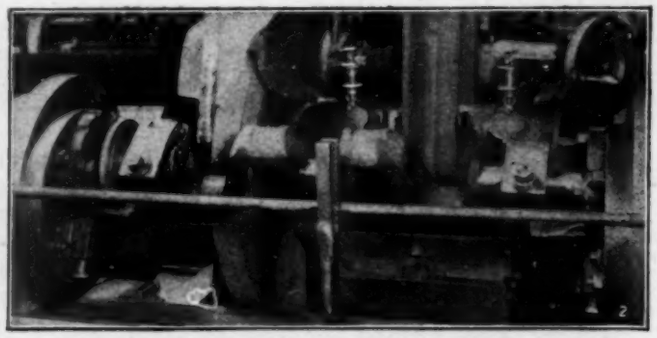
By Elam Whitney

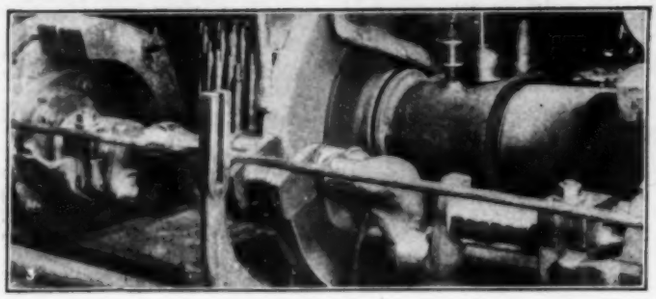
The writer was much interested in the article under the above title by Joe V. Romig on page 694, Vol. 57 of the *American Machinist*.

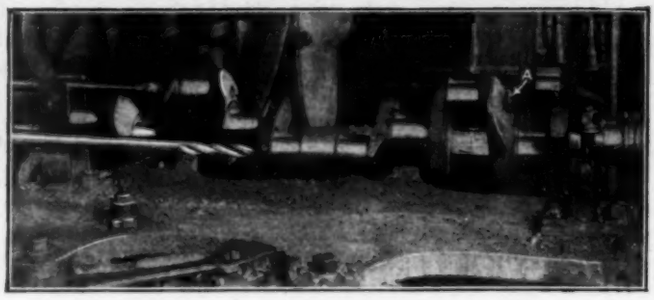
The little old man proved himself to be a first class mechanic and a resourceful one as well, but why, after making good with Reds, the foreman, did he pass on?

Why do our best mechanics, tool and die makers work just long enough to show their skill and then almost without notice check out? It is not always a desire to gain experience which causes such action since their work indicates that they have had a considerable amount, but there seems to be a restlessness which causes them to wander from one job to another. This condition is not shiftlessness as evidenced by the quality of work performed, as well as a good attendance record. It can be remedied to a considerable extent by causing the new employee to feel at home and that he "belongs" just as much as the other employees.









Making Crankshafts in a Commercial Shop

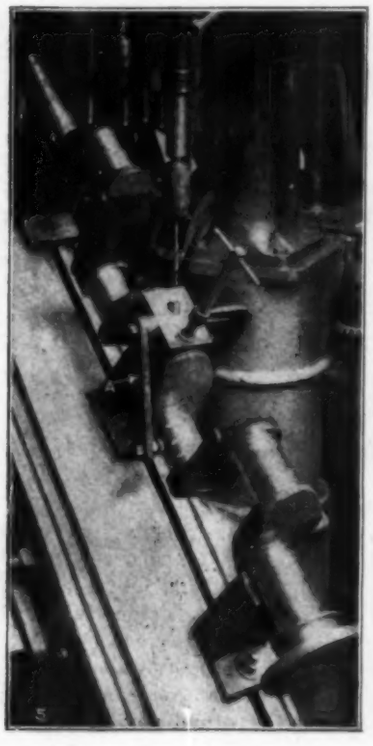
THE COMMERCIAL making of crankshafts necessitates the most efficient methods possible. Some idea of this variety is given in Fig. 7, at the bottom of the page.

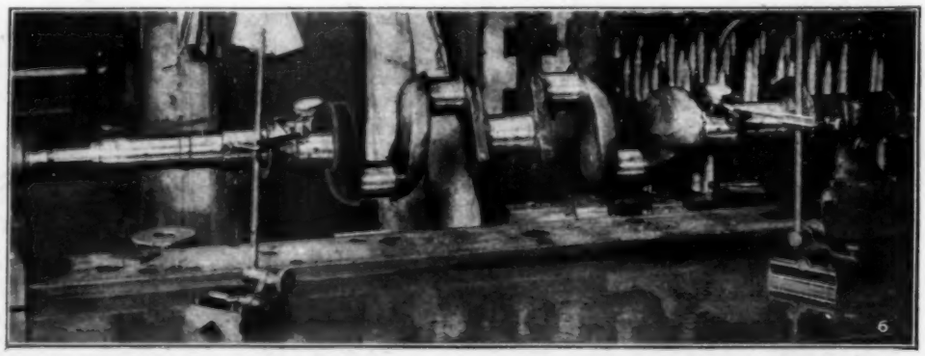
The first operation is usually to spot the main bearings, after which the crankpins are rough turned as in Fig. 1. In some cases the pins are ground from the rough as in Fig. 2. A finish grinding operation on a 6-throw shaft is shown in Fig. 3.

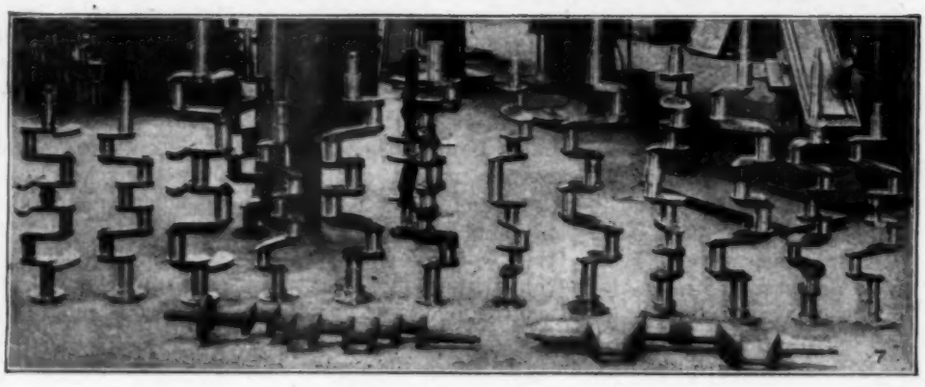
One of the methods of drilling crankpins for lightness is illustrated in Fig. 4. The crankshaft is held on the plate shown. A special head drives the three drills. The boss *A* is left on the forging to afford an easy starting place for the drill. The shaft is reversed for drilling all but the center pins.

Drilling for the oil holes necessary in forced feed is done with very simple jigs, one being shown in Fig. 5. The arm *A* locates the position around the shaft. The block is removed after the drill is well started.

Inspection by means of dial gages is shown in Fig. 6. Some of the crankshafts handled by the Auto Crankshaft Co., Detroit, in whose shop these views were secured, are to be seen in Fig. 7. Bearings are rough turned to within 0.065 in. of size allowing 0.001 in. for the final grinding. A 24 combination wheel gives very satisfactory results for both roughing and finishing.







Management Methods and Principles of Frank B. Gilbreth, Inc.

By K. H. CONDIT
Editor, *American Machinist*

Application of psychology to management not as formidable as it sounds—Success depends on securing co-operation of men—First article outlines principles

SO FAR AS I can find out Frank B. Gilbreth and Lillian M. Gilbreth are responsible for the first successful intentional application of psychology to management. I say "intentional" because psychology has been applied unintentionally and successfully for generations by managers who were unaware that such a science existed.

You probably cannot name a single old-time machinist of your acquaintance who has not a recollection of some old foreman or employer whom he ranks far above his modern successor in knowledge of his craft and ability to handle men. There is little question that these beloved old task masters understood many of the principles of psychology and applied their knowledge with skill. They must have done so to keep green their memories in the minds of men who worked under them in days when twelve hours of plugging constituted a day's work. Time, of course, has dimmed the recollection of their faults, but nevertheless they are the ones responsible for what men look back upon as the good old days.

Science in the form of physics and chemistry has been widely employed in dealing with the materials of industry, and with eminently satisfactory results. Unfortunately men have been slow to employ the sciences of economics and psychology, perhaps because they have been hindered by the doubts and suspicions of ignorance. If there should be any doubt as to the need for their immediate and intelligent use one has only to run through the report of the Committee on the Elimination of Waste in Industry appointed by Herbert Hoover. In every industry mentioned in the published report by far the largest percentage of waste is laid to the shortcomings of management. Further examination of the report shows that these shortcomings are due to ignorance or neglect of the elementary principles of economics and psychology. Over-production, under-production, speculation, strikes, lockouts, ca-canny tactics and other evils can be traced back to this one source.

There are a few notable exceptions, however, and one of them is the work of the Gilbreths, described in the following pages.

To members of the Taylor Society and of the American Society of Mechanical Engineers, Mr. and Mrs. Gilbreth need no introduction, but in the industrial world generally their work is better known abroad than in this country. Mr. Gilbreth has ranked for years as the leading authority on motion study, and his books have been translated into French, German, Russian and Japanese. As a matter of fact, motion study is but one of the many tools used by the Gilbreths in their management work. Their creed is to find the one best way to do any particular job and then to apply the standard so set to the average worker as far as the circumstances permit. This is their interpretation of the late Frederick W. Taylor's definition of management, "To find out how to do a piece of work and then to see that it is done in the best and cheapest way."

Mrs. Gilbreth has spent years of study in psychology and holds the degree of Doctor of Philosophy from Brown University. She is an honorary member of the Society of Industrial Engineers, is the author of books on Psychology and Management and has contributed much to our knowledge of industrial psychology. Her influence on all of her husband's work is very apparent and is probably the principal reason why he has been successful where Taylor failed, in securing co-operation of the workmen in carrying out his plans.

In the early days of scientific management Mr. Taylor was doing valuable pioneer work with the unit of time as his standard of value. To him the amount of work done or the number of pieces produced in a given time

BEFORE WE began the investigation which led to this article and the ones that follow it we had the idea that Frank B. Gilbreth based his work on motion study. Certainly he is generally recognized as the leading authority on this phase of management. It was soon discovered, however, that motion study is but one of many useful tools at the disposal of this firm. The thing about the Gilbreth methods that made the greatest impression upon us was the ingenious and carefully thought out application of psychology at every turn. Our thought in publishing these articles is to show shop managers what can be done by an intelligent use of industrial psychology. At the same time we shall describe mechanical devices that may be employed to advantage by any manager with normal brain power and breadth of vision.

was the sole measure of accomplishment and he made little effort to analyze the motions made by the workman in performing his task. Secret time studies, deliberate soldiering and constant friction between management and men was an inevitable accompaniment. Working on perfectly sound principles he failed to make the success he should have because he ignored psychology.

At about the same time Mr. Gilbreth was doing equally valuable pioneer work but from an entirely different angle. He was interested in the motions made in performing an operation with the idea of eliminating unnecessary ones. He studied the motion itself. Taylor studied the time consumed in making subdivisions of operations. The Gilbreths' interest in motion study naturally led them on to fatigue study and the psychological element became inextricably tied up in their work. Mr. Gilbreth's method of taking the best man available, studying his motions, coaching him where improvement is possible and then setting his performance up as the standard to be reached for implies that the man studied must be thoroughly in sympathy with what is being done and anxious to do his best to get the desired results. Mr. Gilbreth has been remarkably successful in enlisting the enthusiasm of the employee and I am confident that this is one of the strongest factors in his management work.

The Taylor-Gilbreth Controversy

When he and Mr. Taylor first met and each discovered what the other was doing, they formed a mutual admiration society which lasted until Mr. Taylor's passion for recognition as the originator of most of the discoveries of scientific management started a controversy which lasted until his death, and still continues to break out periodically between Mr. Gilbreth and some of the more fanatical of Taylor's disciples.

The controversy does not concern this story. Much of its history may be found in the proceedings of the Taylor Society. Mr. Taylor is dead and few of us realize the value of his remarkable work. Mr. and Mrs. Gilbreth are very much alive and the parents of a family which insures that their work will be carried on from where they leave it.

This is a very cursory sort of an introduction for one of the most successful firms of consulting engineers in this country, but I hope it will suffice to give some sort of a background of acquaintance for the sections which follow.

The Taylor definition of management may be expanded somewhat to read this way—"Find out what is being done now, find out how it should be done, see that it is done as it should be."

The first requirement sounds easy, but it often turns out to be the hardest of the three. In the average shop or office it is usually exceedingly difficult to get a man to tell exactly how a given process is performed because he always has in mind several places where it could be improved and he tries to include the improvement when he describes it.

A careful survey of the existing method is important for three reasons. It places on record all the steps in use at the time the survey is being made and thus makes it easy to retain the valuable ones. It is useful to the consulting engineer in selling his services to the management, for when placed before them it indicates a grasp of the situation on the part of the engineer which encourages confidence in his ability to make improvements. It is also useful for comparative purposes when the job is done, for considerable time is sometimes required to institute new methods, and progress may be so gradual that the management is inclined to lose sight of the accomplishments and minimize the value of the engineer's services. The psychological influence is evident.

The survey having been made it is necessary next to put it in such form that the whole industrial process may readily be visualized by every one who has anything to do with the management. For this purpose a chart has been devised which is a sort of shorthand symbolic sketch of the process in question. It is known as a process chart and may include anything from a single operation to the complete functioning of a large organization. It will be taken up in detail later.

With the present operation of the process or plant clearly in mind plans may be made for improvements all along the line as indicated by experience in treating similar situations and as suggested by the engineer or the men actually doing the work. Part of the visualization scheme is to put the work in such a light that the men become interested in improvements in spite of themselves and offer practical suggestions from their intimate expert knowledge of their particular jobs. Psychology again.

The ultimate result is an ideal process chart which permits the super-functionalization and super-standardization inseparable from high efficiency. To accomplish the ultimate result it is of course necessary to have some sort of a planning department even though it be extremely elementary in the small shop. Existing standards are retained wherever possible and new standards are established to agree as nearly as may be with those existing elsewhere in the industry.

To get the existing standards and to facilitate the establishment of new ones it is necessary to reduce current practices to writing and to institute changes through standardized written standing orders and change orders.

Securing Functionalization

Much the same procedure is utilized to secure the super-functionalization desired. Each executive is required to put in writing a detailed statement of his duties. The 200 or more possible functions of management are then divided among the available personnel according to the dictates of experience and local conditions. In a large plant an executive may have but one or a few functions while in a small one he may have many. The principle is the same in either case.

The aim here is to have every man's job in such shape that he knows exactly what it is, what he has to do and where his responsibility begins and ends. It is of equal importance to have everybody know what the other fellow's job is and its relation to his own. As one step in the accomplishment of this purpose a definite personnel policy is put into effect, a feature of which is a so-called "three-position promotion plan" which has the effect of permanently placing at the highest job that they can hold, the weak sisters who are too stupid or too ambitionless to grow and be advanced. Incidentally labor turnover is reduced and the shop gets "a good name."

Further refinements are introduced through the use of route models or path charts (which should not be confused with process charts as their functions are different), time-study, a suggestion system and motion

study. The motion picture camera has proved an invaluable tool in the hands of Mr. Gilbreth and his staff. At the present time they are prepared to make stereoscopic motion pictures at the rate of 2,500 exposures a second if the nature of the work and the probable value of the results warrant the expense involved. Many other devices for recording the methods and the skill of super-experts, have been devised and perfected and are ready when commercial needs require them.

Contrary to what one would expect, the stereoscopic motion pictures taken of a piece of work are very seldom studied as motion pictures. Consecutive prints are mounted on rolls which are arranged to be viewed through a stereoscope or are mounted on separate cards for purposes that will be discussed later.

In what has been said so far an attempt has been made to give a general outline of the principles involved in scientific management as practiced by the Gilbreths. The principles are certainly simple enough and can be adopted and applied by any one. The advice that appears on the label of the can of ready-mixed paint fits equally here, however, "For best results employ a good painter." To get the full measure of value from these principles employ an engineer who is experienced in their application and has achieved success through their use.

In what follows in later sections it will be the aim to take up the steps just outlined in logical order and to explain the details as completely as is possible.

Interest Essential in Insurance

Some valuable information in regard to the carrying of fire insurance is given in a report recently received from the Chamber of Commerce. Every business man knows that he cannot carry fire insurance on property in which he has absolutely no interest. He recognizes that this would be contrary to public policy, but he is not always certain as to just where the line should be drawn. This "insurable interest," as it is technically termed, is not always easy to define accurately, but as relating to fire insurance, we may consider it as any relation to, or interest in property, or liability arising therefrom, of such a nature that a possible loss might directly cause financial injury to the insured. Such a requirement is particularly essential in fire insurance because the insured is usually in a position where he can cause the loss himself. As the purpose of fire insurance is to indemnify the insured for a loss actually sustained, it necessarily follows that insurance should be granted only to those who might lose by a fire, and then only to the extent of the possible loss.

It will be noted that the definition given does not confine the possession of an insurable interest merely to the sole and unconditional owner of the property. An agent has an insurable interest in the property entrusted to him by his principal because he is liable for failure to exercise due care in preserving it. A mortgagee has an insurable interest in the property which is mortgaged to him since its destruction may injure him financially. A tenant has an insurable interest in the building which he occupies, as he will sustain a direct loss if deprived of the premises by fire. The buyer of a property who has obtained possession, but has not paid off all he owes, has an insurable interest, although he does not yet hold legal title to the property. This is due to the fact that he is liable for any loss which may occur after he has taken possession. The test, therefore, of an insurable interest is whether an injury to the property will cause an actual loss to the insured. If it will, an insurable interest exists.

An insured may have an interest contingent upon something to occur in the future. He may, for instance, have made a shipment of goods to a foreign port upon which he expects to realize a profit. In case the goods are destroyed in transit, this anticipated profit will be lost. Since the owner is thus directly injured financially, he possesses an insurable interest and is permitted to protect the contingent profit by insurance. To recover for loss of profit, this interest must be somehing more than a mere expectancy, and title to the property on which the loss is experienced must reside in the insured at the time of the loss.

Effect of Third Party

Where a third party is liable for injury occasioned by himself or agent to property not belonging to him, an insurable interest exists. For instance, when a locomotive sets fire to fields along its road bed, the railroad company is liable for the resulting damage. This gives the railroad company an insurable interest, which is the basis for a contract protecting against such liability.

In accordance with general practice, the policy is valid if an insurable interest exists at the time of the loss, whether or not it has existed prior thereto. Thus, where insurance is written on crops not yet sown, but which are destroyed by fire after they have been harvested, the insured is permitted to recover.

Another situation is possible where an insurable interest existed at the time the policy was issued and at the time of the loss, but between which a break in its continuity had occurred. For example, where a person whose property is mortgaged parts with the interest which he still has in it upon the agreement of the buyer to pay off the mortgage, but the buyer fails to fulfill his obligations, and the title is then reconveyed to the mortgagor, action can be maintained on the policy if a fire subsequently occurs.

Regardless of other circumstances, it is absolutely essential that an insurable interest exist at the time of the loss. This may only be partial but there must be some vestige of existing interest for the insuring company to be held liable.

Methods for Chemical Analysis of Babbitt Metal Approved by A. E. S. C.

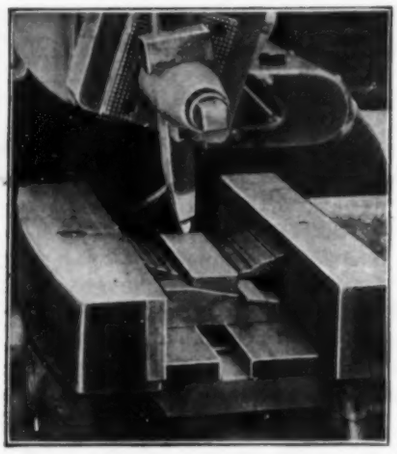
The American Engineering Standards Committee has approved as "Tentative American Standard" the methods for the chemical analysis of alloys of lead, tin, antimony, and copper—otherwise known as babbitt metal—submitted by the American Society for Testing Materials.

Two methods of analysis are included in the document approved by the A. E. S. C. The first is a quick and fairly accurate method intended for practical or shop use; the second is a slower, more elaborate and more expensive, and more exact method intended for reference purposes or for the settlement of disputed questions.

The approval of the A. E. S. C. was voted on the recommendation of a special committee representative of all the interests concerned with the subjects, of which George C. Stone was chairman.

Making Dies for Rotor Stampings

THE illustration shows a number of stages in making dies for rotor stampings as practiced by the General Electric Co., Schenectady, N. Y. The die sections are shaped as in Fig. 1, which shows the method of holding them. In Fig. 2, the second side of the section is being milled, while in Fig. 3 the lower edge is being ground on a magnetic chuck. Fig. 4 shows the holder for grinding the ends, and Fig. 5 a rotating magnetic chuck which holds the section for grinding the sides. A device for shaping the grinding wheel is shown at *A*. When all the sections are completed, they are grouped together in the holder shown at *A*, in Fig. 6, and the outside diameter ground as shown. Fig. 7 shows some of the inspection fixtures used on another type of die section. It also shows some of the sections in different stages, and the assembling and inspection fixtures used. The method of assembling is shown in Fig. 8, together with one of the inspection instruments for testing the sides.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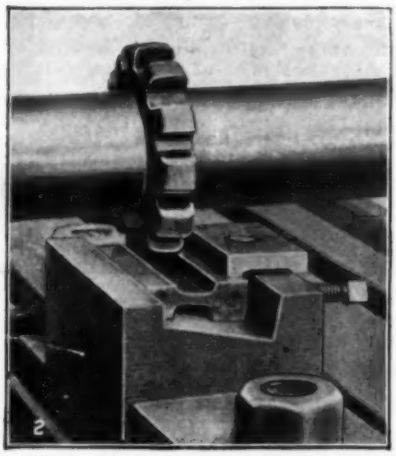
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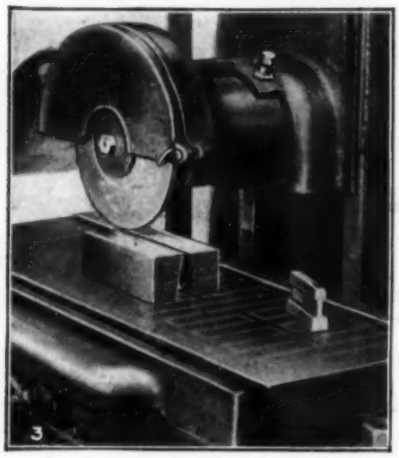
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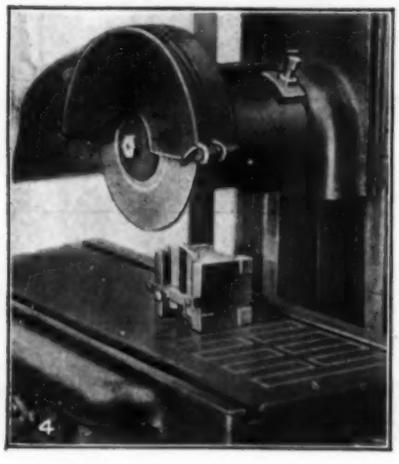
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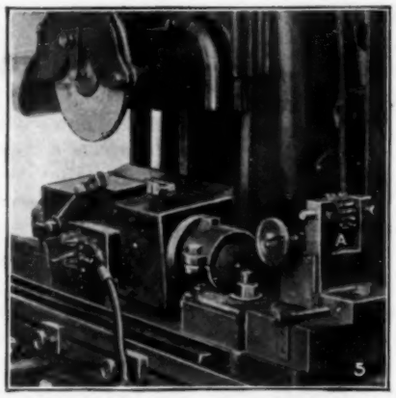
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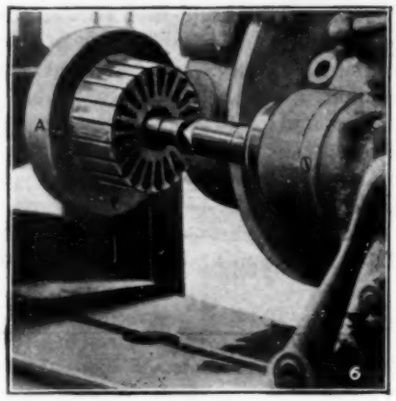
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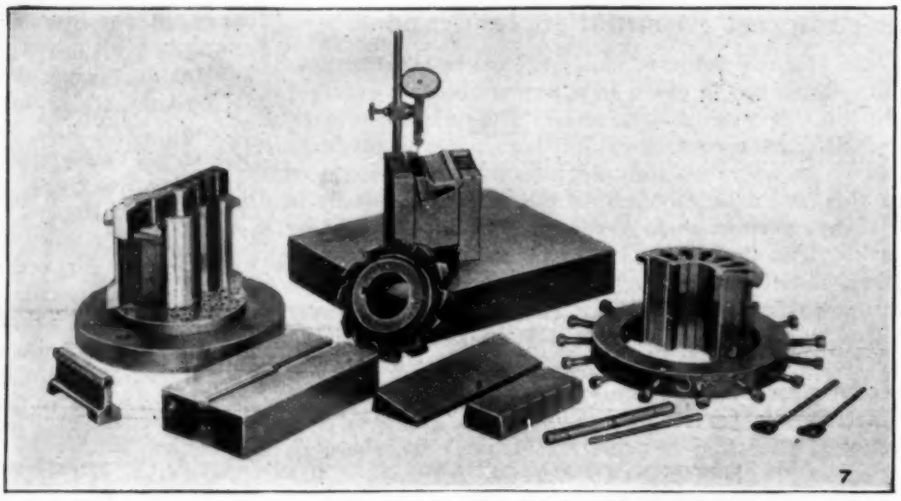
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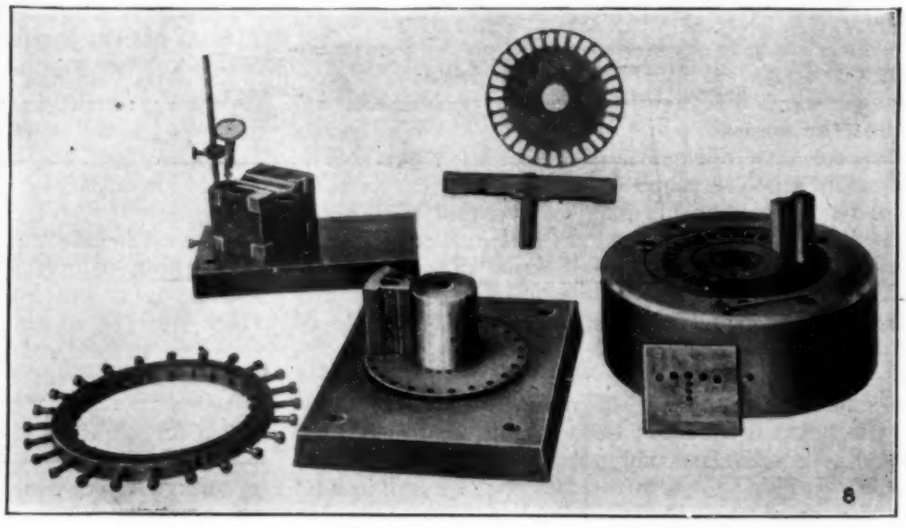
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Measuring Management by Cost Accounting

By WILLIAM R. BASSET
Of Miller, Franklin, Basset & Co.

Accurate measurement requires much detail work—Effect of the human factor—Lack of unit of measurement—Cost finding methods considered most effective present measure

WHEN A SCIENTIST is asked to report upon the qualities of so simple and concrete a substance as a piece of steel he must make a number of measurements and express them in terms of definite and universally understood units. He will use the inch in reporting upon its dimensions, the pound to tell its weight. He can measure its chemical composition, its specific gravity, its hardness and its strength under tension, compression, shear and torsion. He must use a number of units all of which are scientific and exact for comparison purposes.

The management of a business is an infinitely more complex thing to measure than any material can be, and it is taken up largely with that most intangible thing—the human factor. Instead of a dozen things to measure, there are thousands; and to complicate matters further is the fact that no two businesses are at all alike.

Take the single item of management involved in the ability of an owner to deal with his principal executives. He may be 100 per cent effective in dealing with Jones, his salesmanager, because he and Jones are so much alike that Jones' mental processes and peculiarities are an open book to him. Brown, the treasurer, however, may be an able man, but of a different mental cast, so that the owner may be only 10 per cent efficient in handling him. To get an accurate picture of the owner's ability to manage executives, it is necessary to measure his relations with each man. The same thing is true clear down the line to the relations of dozens of foremen with thousands of workers. And this is only one out of hundreds of phases of management that must be measured before we can truly say that we have the measure of any manager.

Difficulty of Devising Units

To measure management accurately would require that each minute phase of management be measured, and that would involve such a mass of detail work as to cost more than it is likely to be worth. Then a multitude of units must be devised, and unless these units are absolute they are next to worthless. Dealing as they must with intangibles, it is doubtful if absolute units can be devised. If units cannot be devised, we are thrown back upon the necessity of expressing the efficiency of any phase of management in terms of the percentage of perfection.

There are two big disadvantages in such a method. In the first place the measurement then becomes the judgment of one or more men as to the excellence of any performance. Experience has shown that when an attempt is made to do this, the judgments of no two coincide. The next trouble is that we are immediately called upon to determine what is perfect performance. It might be possible to set up a standard of perfection for any phase of management in the light of present knowledge, but since improvements are constantly being made, we would soon be in the ridiculous position of stating that a certain concern was 250 per cent perfect in some of its management activities. It hardly seems necessary to point out how this would come about for we all know how rapidly all methods of management and manufacturing have improved within the last few years. Every time that any improved tool takes the place of an old one, standards must be changed.

It is because of all these difficulties but principally because of the exceeding complexity of the measurements that would be required that we still take the profitableness of an enterprise as the measurement of the skill of the management. The weaknesses of this method are, however, apparent enough, although it must be admitted that its advantages are so great that the method persists in spite of its weaknesses.

How One Concern Measured Its Management With Profitable Results

Take, for example, the case of a concern that on a comparatively small investment was earning about $100,000 a year net, a sum which was entirely satisfactory to the stockholders and seemed to indicate that the concern was managed in a highly skillful manner. It was manufacturing seven lines of product. The installation of a modern cost accounting system enabled it to know for the first time its profit and loss by lines of product. The system showed that of the seven lines three were earning a very large profit, one was being sold at about cost and the other three at considerably less than cost. Fortunately this concern was not in a position where it had to sell its losers in order to attract business to the profitable lines. When it really knew the conditions, it forthwith dropped the unprofitable lines and concentrated its selling efforts upon the profitable ones with the result that in less than two years the net profits of the business became $400,000 a year.

That is not an unusual case. It is frequently found that losses in one department are made up by exceedingly attractive profits in another. In this case the cost system was an admirable method of measuring management while the net profits of the business as a whole were not an accurate measure. In the same way I have seen successful concerns, that is to say, profitable ones, which made their profits largely through shrewd buying in spite of the fact that their manufacturing and selling were far from skillful.

In other concerns, and you probably know of many

such, the entire skill of the management seems to be concentrated on the selling effort. The factory methods are inadequate and inefficient and the purchasing a hand to mouth affair done by comparatively uninformed executives. Many a concern which is admirably managed in its manufacturing, selling and purchasing is wrecked through unskilled financing.

Perhaps the discussion so far has indicated what I believe to be the most effective measure of management, that is, a cost finding system. The modern cost finding methods are only secondarily concerned with showing the management what the selling price should be. Their principal purpose is to show how each activity of the business compares with a standard performance. To do this we build up an analysis for each department of the plant on which are listed all of the items of expense incurred by that department. From past experience we set down for each of these items a normal or standard figure which is the (at present) figure of perfect management. Whenever new methods show that this figure can be lowered, it is changed. Against each of them is shown the actual performance for the month. Thus we have a current comparison which shows the excellence or poorness of the management. In the same way we can have normal or standard figures for material usage and for production of labor and machines against which are compared the current performance. Subdivided in this way, and kept up to date, we have definite measures which show, not only how successful the management is, but whether its skill is improving or going back.

The same methods may be applied to selling. The selling figures may be subdivided to any extent desired. In most concerns it is well to set up a standard cost per call by the salesmen. Against this figure each month is shown the actual cost per call. If the actual is above the normal it is due either to an increase in expense or a decrease in the number of calls made by the salesmen. In either event, the reason is shown and steps can be taken to rectify the conditions.

It is not within the scope of this article to show how manufacturing or selling cost figures of this sort are built up. They would be different for nearly every business. The point I do want to make is that a system developed along the most modern methods gives a practical and inexpensive way of measuring every phase of management. It can be made flexible and the standards can be changed from time to time as methods improve. It does away with the need of wasting a great deal of the time of valuable engineers in a search for a probably unfindable standard, or rather, series of standards.

The best minds in the engineering profession would be required for a long period to determine what the unit should be. These minds could much better be put to work finding better methods of doing things than in developing a probably inaccurate method of measuring things.

In short, while I recognize that a prerequisite to improvement is that some way be found to measure management, I believe that such a method now exists in properly devised cost accounting systems.

The New Federal Specifications for Leather Belting

The new Federal Specifications for Leather Belting, which recently have been adopted by the U. S. Government to cover its leather belting purchases, and which is the product of a joint committee of the U. S. Bureau of Standards, and of the Leather Belting Exchange, have been published. They may be obtained from the Leather Belting Exchange, Philadelphia.

The specifications provide for tests which may be applied in any physical laboratory. First, the average tensile strength of five samples of single belting must be 3,750 lb. per square inch. or more, and the minimum strength of any one of these five samples must be not less than 3,000 lb. per square inch of cross section. Second, the average elongation of the five samples at a tensile stress of 2,500 lb. per square inch shall not exceed 15 per cent. The belt itself shall be suspended in a vertical position and sufficient weight, including the weight of the clamp, shall be attached to the lower clamp to produce a tensile stress of 750 lb. per square inch of the average cross section. After fifteen minutes suspension this section of ten feet shall show a length between gage marks not to exceed 10 ft., 7.2 in. (6 per cent stretch). Third, the clamps shall then be removed and the sections allowed to lie loosely on the floor for seventeen hours, after which time the length between the gage marks shall not exceed 10 ft., 1.6 in. (1⅓ per cent stretch). Fourth, the leather shall not show wrinkles on the grain side (commonly called piping) when bent through an angle of 180 deg., grain side in, over forms specified for different grades and thicknesses.

The application of these four tests will expose any inferior stock which may be tested. An unusually high tensile strength, coupled with an excessive stretch and low elasticity, would indicate lower edge stock, which the piping test would confirm, while a moderate tensile strength slightly above the specifications provision, with stretch within the limitations and elasticity as provided, will indicate superior material.

Abnormal Wear of Automobile Valve Seats Caused by High Temperatures

Unless gasoline engines are so designed that the heat generated by slow burning mixtures or preignition is rapidly dissipated, the exhaust valve seats may reach such temperatures as to cause excessive wear.

The Bureau of Standards of the Department of Commerce has recently conducted an investigation to determine the cause of excessive wear of exhaust valve seats of certain engines. This condition occurred only in engines of a certain type and not all engines of this type were affected nor was the wear of all the exhaust valves of a single engine the same.

After numerous experiments to find a cause for this trouble, including an inspection of the metal from which the cylinders were made and a study of the design of cam and valve spring, it was found that the difficulty was due to the high temperature attained by the metal. When the valve and seat were heated to a high temperature by a reducing flame, the wear of the seats was sufficiently rapid to amply explain the difficulty. After this probable cause of the trouble was determined, it was found that the cooling of the valve seats which showed the greatest wear was somewhat defective, thus permitting them to attain an excessive temperature under conditions which often occur in practice.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

Sixth article deals with the organization manual—Section on cost department in full—Contacts and duties of the cost department

IN THE LAST article it was pointed out that one of the first steps to take after the various functions of a business have been divided up into units which are commonly called departments, is to record the functions in the form of an organization manual. The manual is so called because it is essentially a description of the different parts of the organization. When combined with an organization chart, it forms a permanent record of the structure of the business.

So little has been published about organization manuals, whether under that name or some other, that it has been felt desirable to describe such a manual rather fully here. The organization manual is a matter of vital interest to any executive, but especially so to the cost accountant who obtains from it much useful information of aid to him in dealing with the expenses. A point which needs constant emphasis because it is so often overlooked is that it is very difficult and often impossible to set up and operate records for transactions about which one knows nothing. Hence the necessity of the manual.

> THE ORGANIZATION manual is of vital interest to any executive but is especially so to the cost accountant who obtains from it much useful information to aid him in dealing with expenses.
>
> The manual should tell "what" is to be done by the several departments, but not "how" the "what" is to be accomplished.
>
> In addition to the description of the activities of the department, the manual should include a summary of the relationships of the several departments to each other.

Expense accounts are no exception. They are often many and diverse, and even though they are recorded in an expense manual, gaps are often found as well as new items which apparently have not been provided for. In discovering what activity gave rise to them, the organization manual becomes of great use to the cost accountant for in it he can find concise descriptions of the tasks to be performed by each department. Even if the information which he seeks is not contained therein, it is seldom that he will not obtain from it some idea of where to look further.

To be satisfactory, an organization manual should meet two requirements, it should be detailed and complete enough to provide the reader with a definite conception of the work of the several departments. At the same time no attempt should be made to try to include in it a description of the methods employed in their operation, for to do so would make it so long as to defeat its purpose as a handy book of reference. It should tell "what" is to be done by the several departments and not "how" that "what" is to be accomplished. The "how" is unquestionably very important. When satisfactory methods have been worked out they should be recorded in the form of standard practice instructions, a subject which will be discussed somewhat in detail in a later article.

In addition to the description of the activities of the departments, the manual should include also a summary on the relationships of the several departments to each other. The organization chart, as was pointed out in the preceding article, should show the lines of authority and responsibility, and should, in many cases, be supplemented by others which show the other existing relationships. As in all charts, however, it is difficult to obtain a good idea of details even though one gets an excellent perspective of the whole. Hence the written description of the various connections between the departments given in the organization manual is a valuable aid in obtaining a correct appreciation of the complex interlocking of tasks which is commonly found even in small concerns. It is usually much easier to understand a subject when an illustration is used as a basis of the discussion than when such an aid is lacking. It is quite natural here to select for that purpose an example of the section of a typical organization manual which is devoted to the cost department of the concern. Perhaps much of the description will not be as intelligible now as it will be after the reader has perused some of the subsequent articles, but if the manual is to be considered a success, he should obtain a fairly definite, though necessarily general, idea of the work of the cost department.

AN ORGANIZATION MANUAL OF THE AMERICAN METAL WORKING COMPANY

The Cost Department

Object. The cost department has, for its object, the keeping of certain records of the transactions which take place in the factory. These are records in terms of dollars and cents of what goes on in the departments engaged directly or indirectly in turning out the finished product. The department serves as a connecting link between the functions of the planning department, whose records are in terms of physical units, and the accounting department which keeps the accounts showing the receipts and disbursements of cash and the immediate transactions which lead up to and grow out of these cash transfers.

The work of the cost department should be carried on also in such a way as to permit the preparation of various

For the author's forthcoming book. All rights reserved.

reports which are of use to the executives in the control of the business. Some of these reports are a part of the records kept by the departments and other reports are supplementary in their nature. The cost department must also be prepared to assist the planning department by checking the accuracy of the information which comes therefrom whenever it is possible. It should be ready to supply data in regard to the costs of operations or units of worked material or other elements for which it may have records when those data are needed by either the planning department or the manufacturing standards department in their work of developing and utilizing better manufacturing methods. At all times it should be remembered that the cost department is a service department and that the only reason for its existence is the aid which it can give to the operation of the business.

Records Required from Planning Department

Contacts with the planning department. The source of the largest part of the information with which the cost department deals comes from the planning department. The basis for all order and operation costs is the copy of the manufacturing order which should be sent by the planning department to the cost department as soon as the order is started in the shop. This copy of the order should show the order number, the number of the lots or batches into which it is divided, the quantity in each batch. There should also be noted in particular any variation from the standard size batch and the number of such batches, the sequence of operations and any permissible deviation from that sequence, and any special information which may be of benefit to the cost department, such as the order numbers of special orders for tools whose cost may possibly be included in the cost of the order, or the order number of special orders of worked material prepared only for the order. The cost department should refuse to accept any subsequent papers for a manufacturing order until it has received its copy thereof.

All time tickets used by the planning department in dispatching the orders through the factory and also all inspection tickets, must be sent at once to the cost department. Other tickets such as set-up tickets and move orders may be requested by the cost department and should be supplied when so demanded. All these tickets should be returned for correction to the planning department if any error is found which would affect the accuracy of any records made therefrom. They should also be returned if there is any reasonable doubt concerning them either because of illegibility or because of apparent discrepancies.

All material issues, credit slips and worked material or merchandise in slips must also be sent to the cost department as soon as the planning department has completed its use of them. As in the case of the tickets described above, they must be returned for correction if inaccurate or doubtful.

Prompt Dispatch of Reports Necessary

Of equal importance with accuracy is the promptness with which all these papers are sent from the planning department to the cost department. It is a duty of the cost department to insist on promptness and any conspicuous or constant failure in this regard should be taken up by the cost accountant with the assistant production manager (the head of the planning department) at once and the cause of the delay found and eliminated immediately. Belated reports are of little value to the executives and reports cannot be prepared on time if the information from which they are prepared is tardy.

Contacts with the maintenance department. The cost department should also maintain close and intimate contact with the maintenance department and the plant engineer under whose general supervision the work of the latter department comes. The maintenance department must supply the cost department with copies of all repair, work, and improvement orders. The cost department should also receive copies of all standing orders which are issued for the maintenance of any portion of the plant and all change orders modifying the original orders.

The maintenance department must send to the cost department all time tickets for work done by the members of the department. On these should be recorded the expense account symbol for all work done on standing orders, order number for work done on improvement orders, and both for work done on repair orders. All issues and credit slips must also be sent to the cost department as soon as the quantity inventory records are completed from them.

Most of the charges to the maintenance accounts and many of those to the fixed asset accounts come from information which is supplied by the maintenance department. It is essential, therefore, that it be correct and the cost department should return for correction any issues and time tickets, which are incorrect or concerning which there is reasonable doubt.

Contacts with the accounting department. The cost department has many contacts with the accounting department for it prepares for that department most of its information concerning the disposition of the cash disbursements utilized in the factory. These contacts are explained in the following paragraphs in which the various functions of the cost department are more fully described.

Detailed tasks of the cost department. The detailed tasks of the cost department are as follows:

A. The material journal. It is the duty of the cost department to keep the material journal. This journal is divided into three parts in which are recorded the issue from the storeroom of stores material and of worked material and the receipt therein of the completed worked material. The record is made from the material issues and credit slips and the worked material slips. The first step is to extend the price by the quantity to obtain the value. The next task is to sort the slips according to the account to be debited or credited in the case of the issues and credits, and according to the department which performed the last operation in the case of worked material in slips. The credit slips should be sorted separately from the issues, then entered in the same sections as the issues. These vouchers must then be totaled and entered each day in the appropriate section of the journal.

Material Journal Gives Totals to Date

The material journal should be operated in such a way as to make possible the ready calculation of the totals to date for any period. At the end of the accounting period, credit entries for the stores account, the worked material account, worked material in process account, merchandise in process account, and the controlling expense accounts must be prepared from the totals of the material journal and given by the cost department to the accounting department. These totals are also used to check the distributions of material to the various orders and detailed expense accounts.

B. The payroll. It is the duty of the cost department to prepare the factory payroll and the department is responsible for its accuracy and promptness. The payroll is divided into two parts in one of which is recorded the bonus earnings of all employees who work upon tasks for which bonuses are paid and in the second part all other earnings of factory employees.

The clock card record of each employee must be entered daily and all time tickets issued to employees must be checked daily against the clock card record. Errors and discrepancies must be corrected that same day. Each pay period the cost department must supply the paymaster and cashier with a list of the net earnings of each employee, having deducted any advances which may have been made.

The payroll shall be kept in such a way that the entries to the controlling accounts, credit to the payroll account and debit to the worked material in process, merchandise in process, improvements in process and the controlling expense accounts, can be obtained therefrom at the end of each pay period and of each accounting period. The totals shall be furnished promptly to the accounting department at these times.

As a part of the work of operating the payroll, the time tickets shall be extended. In the case of bonus jobs, the bonus must not be calculated until the inspection for the operation is sorted with the time ticket, for bonus is paid only on satisfactorily completed work.

C. The burden. The time tickets shall be used as the

basis for allocating the earned burden to the product. As soon as they have been used for making up the payroll, they shall have entered on them the burden rate for the production center at which the work was done and the extension of the rate by the time made. The tickets shall then be sorted by departments and totaled, the grand total and departmental totals then being entered in the burden journal which must be operated in the same general manner as the material journal. At the end of the accounting period the total for the earned burden must be given to the accounting department to be credited to the manufacturing burden account.

D. Order costs. As soon as the material issues and credits and worked material in slips have been entered in the material journal, those affecting the order costs shall be sorted by order number and batch number and filed in the live file against the order number. They shall be totaled periodically and entered on the order cost card. At the close of each accounting period the entries on the order cost cards for the period shall be totaled and compared with the totals in the material journal. Any discrepancies, if amounting to one per cent or more of the total for any class must be found and rectified before the order costs are calculated.

Finished and Unfinished Orders Separated and Finished Order Costs Calculated

The same thing must be done in the case of the time tickets, both in respect to the labor charge and the burden charge. The time tickets must be reconciled with the payroll book and the burden journal before anything further is done to the order costs.

The finished and unfinished orders must then be separated, the unfinished orders being left in the file and the cost of the finished order calculated. In the case of orders for worked material, the difference between the actual cost and the estimated cost at which the worked material has been taken into the inventory must be ascertained and given to the accounting department so that a general journal entry may be prepared therefrom. In the case of merchandise and improvement orders, a summary of the order costs shall be prepared and given to the accounting department so that general journal entries may be prepared therefrom.

E. Expenses. After entry in the material journal, all material issues chargeable to expense accounts shall be sorted according to the expense account symbol, filed, periodically totaled, and entered on expense cost cards. The same shall be done for the time tickets after entry in the payroll. At the end of the accounting period the totals for these cards shall be checked against the corresponding totals in the material journal and payroll.

The cost department shall obtain from the accounting department a summary of all expenses whose first entry has been made in books kept by that department. These expenses shall then be entered on the expense cost cards and the cards totaled. The cost department shall next post the totals of the expense cost cards to the expense ledger and total the expense accounts for each department to obtain departmental totals. The departmental expenses shall then be totaled and the results checked with the controlling expense account balances. Discrepancies of more than one per cent must be located and corrected at once.

Departmental Burdens Checked With Manufacturing Burden Account

The departmental totals shall next be distributed by the direct expense distribution method to the direct manufacturing departments and the departmental burdens then checked with the manufacturing burden account. The departmental unearned burden shall finally be ascertained and checked with the balance of the manufacturing burden account.

F. Cost department reports. The cost department shall prepare each month reports on:

(1) Stores issued to:
  (a) Worked materials in process.
  (b) Merchandise in process.
  (c) Improvements in process.
  (d) Controlling expense accounts.
(2) Work material issued to (Classification as for stores.):
(3) Work material received (Classified by departments.)
(4) Payroll, amounts paid for (Classification as for stores:)
  (e) Bonus earnings.
  (f) Ratio of bonus earnings to bonus hours worked.
(5) Burden:
  (a) Earned burden.
  (b) Unearned burden by departments.
(6) Expenses:
  (a) Departmental totals.
  (b) Maintenance (by class of maintenance.)
  (c) Retainer (by departments.)
  (d) Reclamation of errors (by departments.)
  (e) Analysis of any of these if called for.
(7) Unit costs (as called for.)
(8) Operation costs (as called for.)
(9) Other reports (as called for.)

G. Expense and burden schedules. It is the duty of the cost department to prepare each year a schedule of the proposed expenses of each department for the ensuing year in such detail as may be appropriate to each department. The expense schedule must be prepared on the basis of the records of the previous year with the prospects for the coming year in mind, and after consultation with the heads of the various departments. It cannot be prepared until after a tentative master schedule balancing production and sales has been made, but it must be worked out thereafter in conjunction with the other detailed schedules which make up the master schedule. When completed it must be approved by the general manager.

On the basis of the expense schedule, the cost department must prepare a burden schedule for each department and burden rates for each production center within the departments. The burden rates must be so calculated that if a normal amount of business is secured during the year and expenses are incurred at a normal rate the entire burden for the year will be absorbed by the production during that period.

H. Standard practice instructions. It is the duty of the cost accountant to prepare standard practice instructions in which are recorded in detail the methods for carrying on all the various activities above described and such others as may, from time to time be delegated to the cost department. These instructions must be sufficiently explicit so that a reasonably intelligent person could be expected to follow them without aid, and they must at all times be kept up to date.

Schedule and Other Tasks of Department

I. Schedules of cost department work. Schedules shall be prepared showing definite dates for the accomplishment of the various activities of the cost department. On the schedules shall be shown the accomplishment of these activities day by day in such a way as to show at all times clearly in what condition the work of the department is.

J. Other tasks of the department. The cost department shall also perform such other duties as may be assigned to it by those in authority over it, and the cost accountant shall at all times endeavor to develop the work of the department in such a way as to enable it to render the greatest possible service to the business as a whole.

Operation of the Department. The cost department shall be in the charge of the cost accountant who shall have full and complete authority over it and shall be entirely responsible for its satisfactory operation. He shall be under the supervision of the factory manager and shall ask him for instructions in regard to any relation with other departments not definitely provided for or concerning which questions may arise.

He shall be assisted by such clerks and assistants as may, from time to time, be deemed necessary and he may delegate such tasks to them as he may wish. He shall have complete authority over them, subject to such general rules as may be laid down respecting all employees or rules established by his superior which affect other departments in addition to his own. His responsibility for them shall be co-extensive with his authority over them. He shall see to it that the work of the department is performed as described in the standard practice instructions, and particularly that it is done accurately and promptly.

A.S.M.E. Adopts Code of Ethics

Adoption of a code of ethics, governing its membership of approximately 20,000, is announced by the American Society of Mechanical Engineers. Ultimately, it is expected, this code, prepared by a joint committee of the national engineering societies, will apply to the entire engineering profession, embracing more than 200,000 professional engineers.

The mechanical engineers are the first to adopt the code, according to the chairman of the joint committee, Prof. A. G. Christie of Johns Hopkins University. This action, Professor Christie stated, marks an advance in engineering ideals, and, in respect to the government of its members as a whole, places the profession in a position analogous to the professions of law and medicine.

The code commands loyalty to country, personal honor, fairness to contractors and workers, and interest in the public welfare. Betrayal of professional confidences, undignified or misleading advertising, and questionable professional associations and practices are prohibited.

The text of the code, as given out in New York City by John L. Harrington of Kansas City, new president of the American Society of Mechanical Engineers, follows:

"Engineering work has become an increasingly important factor in the progress of civilization and in the welfare of the community. The engineering profession is held responsible for the planning, construction and operation of such work and is entitled to the position and authority which will enable it to discharge this responsibility and to render effective service to humanity.

"That the dignity of their chosen profession may be maintained, it is the duty of all engineers to conduct themselves according to the principles of the following code of ethics:

1. The engineer will carry on his professional work in a spirit of fairness to employees and contractors, fidelity to clients and employers, loyalty to his country and devotion to high ideals of courtesy and personal honor.
2. He will refrain from associating himself with or allowing the use of his name by an enterprise of questionable character.
3. He will advertise only in a dignified manner, being careful to avoid misleading statements.
4. He will regard as confidential any information obtained by him as to the business affairs and technical methods or processes of a client or employer.
5. He will inform a client or employer of any business connections, interest or affiliations which might influence his judgment or impair the disinterested quality of his services.
6. He will refrain from using any improper or questionable methods of soliciting professional work and will decline to pay or to accept commissions for securing such work.
7. He will accept compensation, financial or otherwse, for a particular service, from one source only, except with the full knowledge and consent of all interested parties.
8. He will not use unfair means to win professional advancement or to injure the chances of another engineer to secure and hold employment.
9. He will co-operate in upbuilding the engineering profession by exchanging general information and experience with his fellow engineers and students of engineering and also by contributing to work of engineering societies, schools of applied science and the technical press.
10. He will interest himself in the public welfare in behalf of which he will be ready to apply his special knowledge, skill and training for the use and benefit of mankind.

The joint committee which drew up the code was composed as follows:

American Society of Civil Engineers—C. C. Elwell, New Haven, Conn.; A. M. Hunt, New York.

American Institute of Mining and Metallurgical Engineers—J. Parke Channing and Philip W. Henry, New York.

American Society of Mechanical Engineers—Prof. A. G. Christie, Johns Hopkins University, Baltimore; H. J. Hinchey, Chicago; Charles T. Main, Boston; J. V. Martenis, Minneapolis; Robert Sibley, San Francisco.

American Institute of Electrical Engineers—Prof. Comfort A. Adams, Harvard University; C. Paccioli, Pittsfield, Mass.; George F. Sever, Toronto, Ont.; L. B. Stillwell, New York.

American Society of Heating and Ventilating Engineers—Frank T. Chapman and Perry West, New York; S. A. Jellett, Philadelphia.

Safety Week in New York Plants

The safety movement was forwarded in the plants in New York City by a Safety Week, that was in reality a drive to save the lives of the seventy people ordinarily killed by accident each week. The co-operation of the State Department of Labor was a big factor in the safety work undertaken in industrial plants. A knowledge of the steps taken in the drive may be of help to those promoting safety movements. The plan of the campaign follows, the words being those of the Hon. Henry D. Sayer, Industrial Commissioner of the State of New York, as printed in a recent issue of *Safety:*

The Industrial Commissioner and the New York State Department of Labor hailed with enthusiasm the plan of the Safety Institute of America for an intensive accident prevention drive beginning with Safety Week. Much thought has been given and work done in the past to the elimination of preventable accidents in industry, and with splendid results, but the Safety Week idea, by bringing public and industrial safety together on common ground added an element of concerted action which gave promise of adding materially to each branch of the movement.

A letter was prepared and mailed over the signature of the Industrial Commissioner to more than two thousand industrial plants of the city, in which were employed one hundred or more persons. Managers were requested to participate in the campaign by conducting a special safety drive during Safety Week among their employees, by holding mass meetings and by displaying posters and distributing literature. They were advised that speakers for the mass meetings would be furnished on application to the casualty insurance companies or to the Commissioner.

Under separate cover there was sent to each plant a set of posters consisting of two large posters, 28 x 41 in., two small posters, 14 x 22 in., and two triangles (for use on vehicles) 21 x 21 in. Notice was given that additional copies would be supplied by the Industrial Commissioner.

Speakers for industrial plants were furnished by the casualty insurance companies, both stock and mutual, the State Insurance Fund and the Bureau of Inspection of the Department of Labor. To the best of my knowledge there were held over 450 meetings in industrial plants, which were addressed by these speakers.

The number of attendants at these meetings ranged from 50 to over 1,400 persons. From some of the speakers, I learn that the audiences were attentive and showed a willingness to enter whole-heartedly into the spirit of the drive. Employers also showed marked interest by arranging the meetings, many of them being held on the employers' time, although the majority of the meetings were held during the noon period. This circumstance made it difficult at times to meet the demand for speakers.

On the whole, I believe the drive was a great success and will be productive of good results, which will be reflected in the reduced number of accidents during the coming year, especially in the industrial field.

TABLE XIV.

Italy—Imports of Machinery for Working Wood and Metal

"Macchine-utensili, per la lavorazione del legno e dei metalli"

Country	1909		1910		1911		1912		1913		1914	
	Quintali	Lire	Quintali	Lire	Quintali	Lire	Quintali	Lire	Quintali	Lire	Quintali	Lire
Austria-Hungary	748	75,905	485	49,670	403	43,355	544	60,220	340	41,540	401	48,970
Belgium	995	100,910	4,023	403,120	2,178	229,550	3,146	348,836	1,952	235,880	1,782	214,560
France	4,293	437,635	4,383	447,545	4,155	447,335	2,695	307,058	3,415	420,520	2,977	366,560
Germany	62,809	6,363,970	69,459	7,044,295	67,979	7,249,065	67,816	7,554,403	65,318	7,977,580	54,506	6,626,240
Great Britain	11,349	1,136,900	46,141	4,616,995	11,916	1,254,280	15,616	1,722,816	22,411	2,696,470	20,477	2,463,900
Netherlands	429	44,720	201	20,170	160	17,100	3	360	79	9,990	16	2,040
Sweden	53	5,490	.....	.....	99	10,395	.....	.....	14	1,740	60	8,100
Switzerland	701	71,935	1,174	119,595	1,791	191,410	1,278	144,109	1,771	218,220	3,306	399,260
Egypt	78	7,800	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
United States	5,106	517,670	8,195	824,695	9,892	1,042,795	10,994	1,213,268	9,915	1,194,310	6,353	767,340
Malta	.....	.....	84	8,400	4	460	.....	.....	.....	.....	.....	.....
Spain	.....	.....	16	1,600	.....	.....	.....	.....	.....	.....	.....	.....
Denmark	.....	.....	.....	.....	29	3,115	18	1,990	12	1,440	.....	.....
Turkey	.....	.....	.....	.....	123	12,995	.....	.....	.....	.....	.....	.....
Other Countries	.....	.....	.....	.....	.....	.....	1	120	108	13,360	.....	.....
Total	86,561	8,762,935	134,161	13,536,085	98,729	10,501,855	102,111	11,353,180	105,335	12,811,050	89,878	10,896,970

Country	1915		1916		1917		1918		1919	
	Quintali	Lire	Quintali	Lire	Quintali	Lire	Quintali	Lire	Quintali	Lire
Austria-Hungary	5	1,200	.....	.....	.....	.....	.....	.....	2,666	1,576,360
Belgium	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
France	3,368	695,800	6,471	2,481,780	8,592	4,957,200	2,620	1,659,000	2,491	1,507,640
Germany	6,080	1,300,900	26	11,050	115	66,625	.....	.....	8,150	4,794,500
Great Britain	7,895	1,596,800	15,589	5,973,110	14,586	8,419,750	11,825	7,396,360	6,766	4,005,200
Netherlands	23	4,600	.....	.....	.....	.....	.....	.....	.....	.....
Sweden	.....	.....	213	80,940	254	146,050	.....	.....	818	487,240
Switzerland	15,832	3,632,000	53,088	20,394,705	14,884	8,714,460	18,359	12,121,140	22,246	13,451,540
Egypt	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
United States	32,898	6,681,200	148,560	56,574,990	111,939	64,738,065	44,706	28,372,310	20,614	12,072,600
Malta	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Spain	42	16,800	529	202,325	158	92,750	95	58,900	.....	.....
Denmark	.....	.....	.....	.....	.....	.....	.....	.....	45	26,100
Turkey	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other Countries	759	151,800	406	155,315	115	66,125	.....	.....	63	36,540
Total	66,902	14,081,100	224,882	85,874,215	150,643	87,201,025	77,605	49,607,710	63,859	37,957,720

Par value of Lira is 19.30c.
Quintale=100 Kilograms=220.46 lb.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Substitutes for Welding in Auto Repairs

BY DONALD A. HAMPSON

Widespread use of automobiles and the development of a welding outfit that anyone could use came at about the same time, resulting in a revival of business for hundreds of small machine shops, the opening of thousands more either in connection with garages or independently, and the installation of an acetylene welding outfit in most of these shops.

The range of work to which the welding torch is applicable and the ease with which any sort of a laborer can do an apparently good job have caused it to become the first thought in repairs. Then, where one of two shops in a community did welding while the other did not, the welding drew so much more automobile work that the shop stressed this particular feature and welded everything that could possibly be repaired in that way.

This has come to be the curse of the welding game. The presence of two tanks and a torch have so altered the perspective that, out of three jobs, two that could be repaired better by other methods have been botched by a weld. It is not inferred that welding, as an art, is a failure, but the vast majority of men who are welding have not the facilities for doing a good job, they do not understand the strengths of materials nor realize the stresses to which an automobile part is subjected. The prospect of a dollar in hand attracts

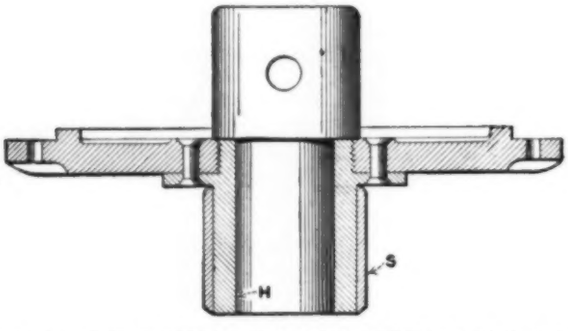


FIG. 1—DIFFERENTIAL CARRIER WITH BROKEN HUB

more than a satisfied customer six months from now.

The same thing would be true of, say, lathe work if it were pushed to an extreme, to the exclusion of better adapted methods. If every Tom, Dick, and Harry were given particular lathe jobs to do, with only a couple of hours' instruction as to the tool, there would be as much dissatisfaction with lathe work as with welding. The fact that lathe work is not as simple as (apparently) a little heating and sticking two parts together, has tended to build up a wall of respect around it so that the average over-night mechanic leaves it alone.

The following example will illustrate methods other than welding, for making typical automobile repairs, at no greater expense than welding and more durable, yet within the same range of men and equipment as required for first class welding. A differential carrier which has had the hub broken off is shown in Fig. 1. The usual procedure is to bevel the corners and stick the hub back in its original position, filling up the space with the welding rod and adding as much more metal as interfering parts will allow. The chances that

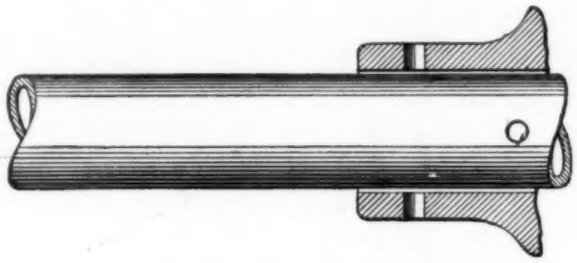


FIG. 2—A JOB THAT SHOULD BE BRAZED

the hub will be as true as when new are slim and the chance of its remaining whole for more than a thousand miles run is even more so.

As contrasted with the chemical repair, we have the mechanical one shown in the sketch. A new hub *H* is cut from a piece of mild steel and screwed into the center of the carrier casting which has been chucked and threaded true with the ring surface. The thread is as tight as can be assembled and the hub is screwed until a flange on it seats against the faced off back of the carrier. Rivets through both parts complete the job. The roller bearing sleeve *S* is pressed back into its original position.

Cylinder scores are frequently filled up by welders and the owners pay their $2 or $5 and take the cylinders away, thankful that they did not have to buy a new block. But when they themselves start to file out the hump that the welder left, or spend half a day trying to find the machine shop that can cut it out in a little while or, perchance, come to a shop that has a cylinder grinder coupled with an experienced man and learn that heat has so warped the cylinder that the hump will have to be ground out and new pistons fitted, then that feeling of thankfulness toward the welder vanishes, and quite properly so.

Even when better-than-the-average men and equipment are available, welding is the poorest form of repair for cylinder scores. An experienced metal pattern maker or tinsmith can solder up a cylinder score and make a job that will stay as long as the car lasts. The amount of heat applied in soldering cannot possibly distort the cylinder and a machinist, using the piston as a marking plate, can scrape in a splendid surface. What has come to be known as the Lawrence process is the best cylinder bore repair, and the cheapest, if one lives within shipping radius of one of the plants. This process deposits silver-nickel in the score and the work

is done without perceptible heat. The silver-nickel, uniting with the wall makes a wearing surface as durable as the cast iron.

A case that is often met with in old cars is represented by Fig. 2. The rear axle housing is of the built-up type and due to loosening of the rivets or lack of original fit, a space exists between housing and tube. New rivets may be put in but they will not remain tight; sometimes a piece of thin metal can be interposed but it seldom can be worked over the entire area and the job is no better than with rivets alone. Finally, someone suggests that the parts be welded, oh yes, why hadn't that been thought of before—it will close the gap up tight.

The parts are riveted once more, it's a shaky job, of course, because there is no good bearing to draw up on, and then the torch applied to the end of the housing. Besides closing up the annular opening, the welder is apt to melt away a section of the tube, but at last he gets the thing built up in true plastered-on-form and the owner takes the axle away. A few months later the case loosens up as of old—the welding could not penetrate any distance and was really no more effectual than a piece of soft wire caulked in the opening.

Brazing is the proper job for a loose housing or case. With a couple of rivets or temporary bolts to hold the assembly, the spelter can be made to flow to every part of the joint and, if the members have been rightly cleaned, will unite the two members with a grip equal to rivets. The regular rivets, however, must be replaced. Brazing and soldering are old fashioned processes that have been more or less overlooked with the universal use of welding, unfortunately so because their field has widened with the increase in automobiles.

Regarding the major parts of a car, the best repair and the cheapest in fully fifty per cent of breaks is a new piece. Owners need a great deal of educating in this respect—educating that must be done by the machinist or mechanic. The latter must be able to differentiate between the part that may be rationally repaired and the part whose repair is a waste of time, entailing a re-break in the near future and requiring a repetition of all the work involved in detaching a hundred parts to get at one.

In justice to welders, it must be said that they do weld many pieces under the pleading of customers, often "just to get me home." The worst of this get-me-home proposition is that the owners forget all about the repair, once they are rolling along and do not remember it until a more serious accident happens. Parts such as spring leaves, axle shafts, and crank shafts should never be welded. Even though the filler material were of the same grade as the original, the part could not attain its former strength until entirely heat treated—and no one along the road has facilities for doing this.

A Drafting Room Kink

By Henry R. Bowman

Recently I had occasion to draw some ink lines that were too wide to be made by an ordinary drawing pen.

I have tried drawing two or more parallel lines so as to form a solid line, but have found it hard to keep the width of such a line uniform.

I tried using a railroad pen, filling the two pens and also the space between them with ink and it proved entirely satisfactory.

Catching the Thread by the "Jump" Method—Discussion

By W. E. Butler
Camborne, England

The articles which have appeared in the *American Machinist* under the above title have been very interesting, although the writer fails to see why these methods, which are slow and except in the hands of experts liable to result in much scrap, should continue to be used when almost any engine lathe can be equipped in less than an hour with an indicator which makes catching the thread a certainty.

Referring to the article by B. A. Donley on page 970, Vol. 56, his method is simple to manipulate when the thread of the lead screw and work are comparatively coarse but, like the Editor, I should hesitate to use it on fine pitch screws. The method described by John Hansen on page 307, Vol. 57 is perhaps the oldest and most known method, but this again is slow, and when watching the chalk marks on lead screw and work it is by no means impossible to *think* you have got it when you haven't, unless the lathe is actually stopped to bring the marks into correct relation.

The majority of the foregoing remarks also apply to the method described by H. O. Turnbull on page 352, Vol. 57, and it is possible by this method to close the half nut half a dozen times or more only to find that a fresh start is necessary.

There is another method, used by some of the older lathe operators with whom the writer has come in contact, which consists of counting up to a certain number, or repeating a rhyme. Starting as the tool is being withdrawn from the cut, the carriage is run back to a stop at a uniform speed and in time with the words, the tool is re-set and the half nut closed on reaching a certain number, or a definite word in the rhyme. By this method the writer has seen fine threads cut at high speed without a miss.

The method described herewith has been used by the

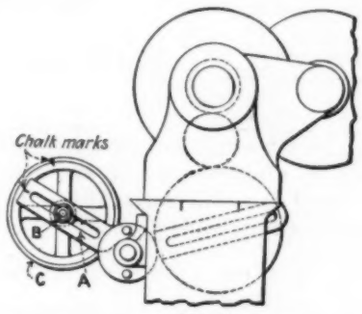


Fig. 1

Fig. 2

FIG. 1—INDICATOR GEARS FOR CATCHING THE THREAD
FIG. 2—DIAL FOR USE WITH 48 TOOTH WORM WHEEL

writer for many years and was found especially useful where female labor was employed during the days of dilution. All that is necessary is a piece of flat stock, approximately 2 in. x ½ in., as shown at *A* in Fig. 1, and a stud *B* similar to that used on the regular quadrant. Part *A* is slotted to carry the stud and is bolted to the lathe by one of the quadrant bolts, or, if this is impossible, a longer piece can be fastened to the lathe leg or floor so that it is visible from the operating position. A change gear can now be mounted on stud *B* and driven from a gear on the lead screw.

With a lead screw of ¼ in. lead, a ratio of 1 to 4—

say 20 driving 80—will cover most threads. This gives us one revolution of the indicator gear C to every four revolutions of the lead screw. Now, bringing the carriage back against a suitable stop and turning the lathe until the half nut will close, mark the indicator gear C and the quadrant A. After the first cut, the carriage is brought back to the stop and the half nut can be closed every time the marks coincide without any undue manipulation of the belt shifter or half nut; and at high speeds.

The ratio of the indicator gears for all whole numbers of threads per inch is:

$$\frac{1}{\text{Threads per in. in lead screw.}}$$

For all threads per inch containing a fraction, such as $2\frac{1}{2}$, $2\frac{1}{4}$, etc., it is represented by the numerator of the fraction $\frac{L}{N}$ reduced to its lowest terms; L equalling the number of threads per inch in the lead screw and N the number of threads per inch in the screw to be cut.

When cutting threads containing half or quarter threads per inch, compound gearing has to be used and another stud becomes necessary, but it is possible to indicate correctly any thread by this method as the following examples will readily show:

Example 1. Required 31 threads per in. Lead screw 5.

$$\frac{L}{N} = \frac{5}{31}$$

Ratio of indicator gears 1 to 5. Gears may be 20 tooth driver and 100 tooth driven.

Example 2. Required $2\frac{1}{4}$ threads per in. Lead screw 6.

$$\frac{L}{N} = \frac{6}{9/4} = \frac{8}{3}$$

Ratio of indicator gears 1 to 8. Compound gearing will be necessary, and may be 20 and 30 drivers with 80 and 60 driven gears respectively.

Example 3. Required $1\frac{1}{3}$ threads per in. Lead screw 4.

$$\frac{L}{N} = \frac{4}{4/3} = \frac{3}{1}$$

Ratio of indicator gears 1 to 3. Gears may be 20 driver and 60 driven.

In addition to being a positive method of catching the thread, indicator gears as described above and also the regular type of indicator may, in some cases, be used to facilitate the cutting of multiple threads. The numerator of the fraction resulting from $\frac{L}{N}$ gives us the number of revolutions of the lead screw between each position at which it synchronizes with the thread being cut.

This method, although it is not always applicable, will in many instances save considerable time, as by its use all the starts of a multiple thread can be cut without marking the change gears and dropping them out of mesh to obtain the necessary division of the work as is the usual practice. Actually the lead screw and nut become the dividing mechanism, and these are usually as correct, if not more so, than the gears.

The following examples will show the application of this kink:

Example 4. Required $2\frac{1}{2}$ threads per in. Lead screw 4.

$$\frac{L}{N} = \frac{4}{5/2} = \frac{8}{5}$$

The number of revolutions of the lead screw between points of synchronization will be 8 and the factors for compounding will, therefore, be 2 and 4; the ratio being 1 to 8. The gears may be 25 and 20 drivers with 50 and 80 driven gears, respectively.

We can then cut a multiple thread of $2\frac{1}{2}$ threads per in. (0.4 in. lead) with 2, 4 or 8 starts by using two, four or eight equally spaced marks on the indicator gear. By closing the half-nut at each mark in turn for every advance of the tool all of the starts will be finished together, with the advantage that no stopping to index the work will be necessary.

Example 5. Required a triple thread of 1 in. lead. Lead screw 6.

$$\frac{L}{N} = \frac{6}{1}$$

Ratio of indicator gears 1 to 6. Factors 2 and 3. The driving gears may be 20 and 30 with 40 and 90 driven gears respectively; every thirtieth tooth on the 90 gear being marked.

It will be seen that multiple threads, the lead per inch of which is divisible by the number of threads per inch in the lead screw without remainder, cannot be cut in multiple by this method, but all other leads can. For this reason it is sometimes an advantage to take into consideration the pitch of the lead screw of a lathe when allocating multiple thread jobs. For instance, a thread of $\frac{1}{3}$ in. lead can be cut as a double thread with a lead screw of 4 and as a triple thread when the lead screw is 6.

When using the regular type indicator for cutting multiple threads it is only necessary to note the numbers on the dial at which the half nut can be closed to catch the same thread and divide this by the number of starts required to find the other positions. For example, to catch the same thread each time we may have to close the nut on every other numbered division, then by closing alternately on the odd and even numbers we can cut both starts of a double thread.

In conclusion I should like to point out that it is often advantageous to increase the number of teeth in the wormwheels of indicators so as to obtain a greater number of factors. Fig. 2 shows the dial of an indicator for use with a lead screw of 4, using a wormwheel with 48 teeth in place of one with 32. This gives the extra factors 3, 6, 12 and 24; and odd threads which require either of these numbers of revolutions of the lead screw between the synchronizing positions can be cut more readily and in addition to those which can be cut with a 32 tooth wormwheel.

Checking Inverted Spline Broaches—Discussion

BY GEORGE E. HODGES

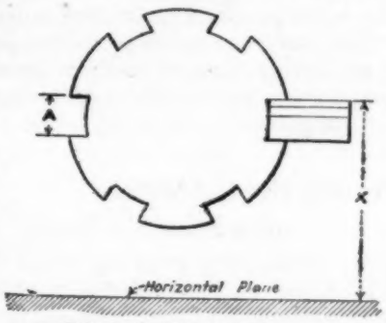
I dislike to take issue with H. R. Sleeper, whose article on checking inverted spline broaches appears on page 812, Vol. 57, of *American Machinist*. I have known Mr. Sleeper for several years and hold him in high esteem as a tool designer.

The diagram used in the article is not correct in its dimensioning: C does not equal the square root of the difference of the squares of A and B, in the diagram. [Editor's Note: B was shown incorrectly in the illustration accompanying Mr. Sleeper's article. It should be the radius of the shaft, being drawn from the center

of the section to the circumference between the splines. The fault is not with Mr. Sleeper, as the line was correctly drawn on the sketch furnished by him.]

Again, the method described is inadequate. There is nothing to be gained in measuring the chord *X*. If there is an error in the indexing, Mr. Sleeper's method will not locate it. This is because it does not disclose which side of the spline has the stock if the chord is oversize, or whether the inverted spline is central even if the chord is to size.

The accompanying sketch shows a six-spline section of an inverted spline broach. The dimension *A* is checked with a gage block or blocks to fit the inverted spline as it is machined. A gaging fit is made, the blocks are slipped into place and the dividing head crank given ten turns to bring the blocks into a horizontal position. The distance *X* is now measured with a height gage and recorded. The dividing head crank is given twenty turns and a reading taken of the distance *X* on the opposite side. This reading should agree with the first reading if the base of the height gage is kept on the same horizontal plane. If the two readings do not agree, the spline is machined off center. The size blocks will show whether the dimension has been maintained or not.



CHECKING INVERTED SPLINE BROACH

I have assumed that a universal dividing head would be used in the machining of the broach, requiring forty turns to revolve the work once. A dial indicator is usually used in place of the height gage and mounted on a surface gage spindle. The height gage is best, however, as there is some play in all dial indicators where the spindle works in the bushing.

I have seen the dimension of the chord vary by as much as 0.006 to 0.008 in. without affecting the use of the broach. Slightly rounding the sharp corners on the male piece, which is done in all good shops, does a lot in counteracting the inaccuracies of the broach.

If it is desired to check the relation of the splines to each other, the proper gage blocks are used to fit the machined spline and the work divided as shown in the American Machinist Handbook under title of plain indexing. Allowance should be made for any changes required in fitting the gage blocks to the machined spline. The work should be checked before removing from the machine or loosening the collars of the steady-rests, as the work must be straight when checked.

Lubricants in the Shop—Discussion

By Raymond Bequet

Upon reading the article under the above heading by Leslie Tourtellotte on page 778, Vol. 57 of the *American Machinist*, I felt as though I had met a friend. White lead and threading have long been synonymous in my experience. I have always seen a "pure" lard oil recommended for threading both by manufacturers of threading tools and authors of technical books. Knowing the advantages of white lead I had come to a point where I began to doubt ever having seen "pure" lard oil. White lead when mixed with lard oil to the consistency of thin paint can be used on both taps and dies with very good results. It also works equally well on both cast iron and steel. On threads of very coarse pitch the lead may be left a little thicker.

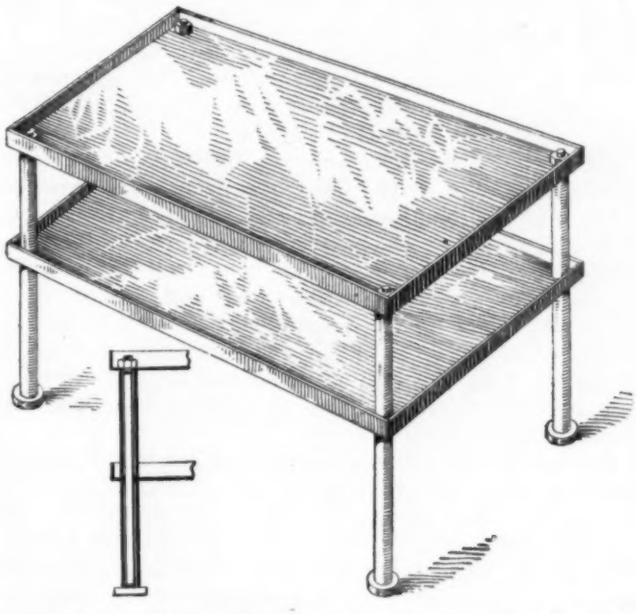
A thread when cut with this lubricant always has a thin film of the lead adhering to it if there is sufficient lead in the mixture. This is true even when the thread being cut would ordinarily develop too much heat for the amount of lard oil that could be supplied to it.

An All-Metal Machine Bench

By G. A. Luers

The machine bench shown in the illustration is novel in that it is entirely of metal and formed of tray-like plates secured with stay rods passing through short sections of pipe. The simplicity of construction is advantageous as a substantial bench is made up with a minimum of labor and machine work. In fact, where plates of the desired size are available it is necessary only to turn up the edges of the sheets and drill a few holes.

The pipe lengths are readily cut off, leaving only the rods to be threaded. The feet, or flanges, are made up from any size of disk that is convenient and the upper ends of the stay rods are fitted with nuts. Because of the construction the nuts may be tightened up a little if the bench shows a disposition from rough handling to become shaky. The turned up edges of the trays prevent work or tools from rolling off.


PORTABLE BENCH MADE FROM SHEET METAL AND PIPE

A small shop may need only one bench or a larger shop may require many. In either case it represents a considerable saving, for there need be no preliminary consideration nor is any special material needed.

Because of the ease with which they can be transported, these benches are extremely useful around the garage or repair shop. In the shop where this one was designed it is even moved out of doors when occasion requires.

American Machinist
Established 1877
Kenneth H. Condit and Fred H. Colvin
Editors

January 4, 1923

Beginning Volume 58 of the American Machinist

WITH THIS ISSUE begins Volume 58 of the *American Machinist*. The paper was established in 1877 and has continued under the same name without additions, mergers or offshoots since that time. It has passed through the hands of several publishers and many editors all of whom did their part in making it the journal it is today.

The present editorial staff consists of Kenneth H. Condit and Fred H. Colvin, editors, A. L. De Leeuw, consulting editor, L. C. Morrow, managing editor and S. A. Hand, Ethan Viall, Ellsworth Sheldon, Howard Campbell and C. J. Priebe, associate editors.

What's Wrong With the Railroad Shops?

THE FIRST ARTICLE in this issue represents both the conclusion and the climax of our series telling of conditions in the railroad repair shops as they are today. The preceding installments were devoted principally to discussion of shortcomings of equipment, methods and personnel. This one gets down to underlying causes and suggests remedies.

Some of the improvements we recommend are well within the power of the present railway managements to effect and without great expense. Others are beyond their ability unless co-operation from government regulating commissions and the labor unions can be secured. Past experience does not lead one to very optimistic views on the possibilities of such co-operation but the situation of our transportation system is so serious that even the most narrow-minded commission member, railroad official or unionist must see the crying need of drastic action.

Our method of attack in these articles has of necessity led to a certain amount of generalization. In articles to come during 1923 we propose to take up specific instances of money-losing practices in prominent shops, omitting names and locations. We also propose to describe in detail how some of the remedies we have suggested are actually being employed in certain shops.

In answer to questions that have been asked regarding the series we might add that it is the result of a personal investigation made by our consulting editor. The conclusions represent not only his views but those of the rest of the staff as the articles were written only after each point had been discussed by the staff and agreed upon.

Probably the most important change in railroad practice we are advocating is the standardization of rolling stock, at least as to certain parts. An immediate and appreciable saving all along the line would result from such standardization. To the skeptic let us say right here that at least one railroad has already made much progress in this direction as will be shown in articles soon to be published.

As our last word we want to say, as we have said several times before, that we have endeavored to avoid blaming any particular group for the troubles we have mentioned. We have the utmost sympathy with the men who are charged with the direction of the railroads and the various subordinate divisions all down the line in the difficult situation that confronts them. They are between the upper and nether millstones of commission regulation and restrictive union rules. Our feeling is that they are so close to the job and so engrossed in protecting themselves from these two foes that they are not in a good position to institute reforms. Hence our suggestions.

Putting the Calendar on a Sensible Basis

DURING 1923 a strong effort is to be made to assemble an international conference for revision of our inefficient calendar. The establishment of the standard time zones was not such a very difficult matter and the rearrangement of the calendar is little harder.

To most of us the calendar has been such a venerable, almost sacred institution, that any suggestion of change comes with something of a shock. Yet when we come to look up its history we find that it is a very arbitrary sort of a schedule cheerfully bungled by autocratic and self-important Roman emperors.

The Julian calendar was borrowed from the conquered Egyptians by Julius Caesar. Until the Roman got his hands on it, the Egyptian calendar was a symmetrical affair of twelve thirty-day months, the extra five days being segregated at the end of the year as a festival. Odd numbers were considered lucky by the Romans so the imperial calendar maker arbitrarily took the five feast days and added one to each of the odd months as far they would go. Thus January, March, May, July and September had each thirty-one days. When Augustus came to the throne he promptly remedied the serious defect in the calendar which gave his month only thirty days where his predecessor's had thirty-one. He first took the twenty-ninth day of February and added it onto August, then as a result of complaints from various quarters moved the last day of September to October and the last day of November to December.

The complications caused by the extra day in each year and the leap day every fourth year have caused trouble for all of us by making the days advance each year. Statisticians are constantly in hot water in their endeavors to compare thirty and thirty-one day months, months with four Saturdays and months with five, quarters with ninety days and quarters with ninety-two. Their problem is a simple one compared to that of the housewife who has to pay bills on five Saturdays with one month's pay and that of the small tradesman who has to carry his customers in five-Saturday months.

The solution offered by the International Fixed Calendar League is to cut off the days over twenty-eight in our present months and gather them into a new

month, Sol, to be inserted between June and July. The extra day would be an international holiday without a day name and known as January O, because of its position just before January 1. Leap day would be moved to midsummer and also be an international holiday without name and designated as June O or Sol O.

With this arrangement there would be no change in day dates. Sundays would fall on the first, eighth, fifteenth and twenty-second of every month and holidays would stay put. The League has thought out answers to all possible objections and has obtained the sanction of various religious authorities to the changes in sacred holidays necessitated by the new calendar.

Business men may expect to hear more from the League during this year as the purpose is to call the international conference in time to make the proposed change effective in 1928. The proposal should be given careful consideration and whole-hearted support if no flaws can be discovered in its provisions.

Machinery Markets of the Future

IN MOST first-of-the-year forecasts the prognosticator limits himself to the twelve months just ahead. Such has been our own practice but this time we are extending our vision to cover a longer period. Immediate prospects for improving machinery markets are so good that we feel justified in looking farther afield.

The machinery market may be analyzed from two different angles, by geographical divisions and by industries. Taking the first of these let's see what we have.

England has long been a leading customer for most kinds of machinery, particularly machine tools. She has passed through a serious depression just as we have and seems to be on the way back. If we take foreign exchange as a measure of relative business soundness we have but to look at the recent improvement in sterling exchange to see the rate at which England is coming back.

The former British colonies, Canada, Australia, New Zealand, India and the South African group, now big and flourishing countries, have bought American machinery in the past and will continue to buy. The association of nations which we are told is to replace the old empire may result in trade policy changes of far reaching effect. For the most part these new countries are mines of undeveloped resources and will grow in importance as machinery buyers.

Another great potential market for machinery exists in South America. The southern continent is now in about the condition our middle western grain states were in a generation ago. Railways, highways and power plants must be constructed to prepare for the industrial development that is coming.

The other southern continent, the "darkest Africa" of Stanley and Livingstone, is rapidly becoming less dark and disclosing unexpected treasures. Here the surface has hardly been scratched and the market will be whatever sound pioneering can make it.

Not many of us realize what an industrial development has taken place in India. Railways, iron works and textile mills are but a few of the industrial enterprises that will be found well advanced. Most of the machinery and equipment of India has naturally come from England but America has obtained a foothold which should grow firmer as time goes on.

Japan is making a lot of her own machinery but there is still, and probably always will be, a market for American products of the first quality. The Japanese workman does not take kindly to the effort necessary to produce machinery of high precision.

In China there is a real opportunity. With a large portion of the iron deposits of the world within her borders, abundant labor and a tremendous population to feed, machinery must come as the solution to many problems. Fortunately, America stands high in Chinese esteem and will get the benefit of the doubt if the choice is a close one.

We learn from reliable sources that Russia has passed the crisis and is on the way back to production and a place among the world's markets. Here again America, through her relief work, is in an enviable position and should reap a harvest of orders when the Russians begin replacing the ruined equipment of their farms and factories, and resuming the development of their tremendous resources.

And now, what of the industries? Suppose we start with transportation. In the United States, where the railroads are the finest in the world, we have seen them near to collapse because of lack of equipment. What must be the need for locomotives and cars elsewhere?

Industry depends for its very existence upon power. All over the world millions of horsepower are running to waste down the rivers and wait to be harnessed by hydro-electric plants. In Scandinavia, in Italy and in Switzerland a start has been made, but elsewhere outside of the United States little has been done.

The automobile market in this country has approached the saturation point so many times that we begin to doubt the existence of that theoretical trade damper. Yet we have many more automobiles per thousand population than any other country in the world. Can there be much doubt as to the existence of tremendous future markets for automotive products?

America leads the world in communication machinery. The telephone, the telegraph, radio, all have their highest development here but still it seems impossible to satisfy the demand for equipment. What will it be when the world demands rapid intercommunication?

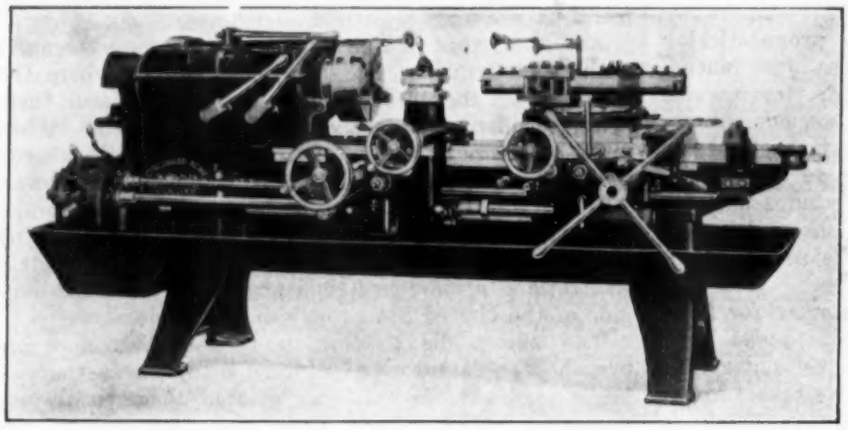
One could go on this way indefinitely but space is limited. We have not touched on textile machinery or sewing machines, on printing presses or typewriters, on agricultural machinery or household mechanical appliances but the future world market for all of them stretches out in an ever-widening circle. Shall we go after it or be satisfied to sit at home?

"WHAT IS A living wage?" is about as simple a question to answer as "How long is a string?" Kindly specify if the man who is to get the wage is single or married, whether the number of his children is one or none or legion; whether he lives in a three-room flat in New York at $75 a month or in Xville in a 6-room cottage with plenty of ground for a garden at $15 per. When we know all this and much more we will ask somebody with more brains than we have what a living wage is.

Shop Equipment News

Cincinnati Acme Universal Flat Turret Lathe No. 2

The features of the No. 3 universal flat turret lathe made by the Acme Machine Tool Co., Cincinnati, Ohio, and described on page 203, Vol. 48 of *American Machinist*, have recently been incorporated in the No. 2 machine herewith illustrated. The cross-sliding main turret and cross-sliding square-turret side head provide a simple tooling arrangement that allows the use of as many tools as needed for a very wide range of operations.



CINCINNATI ACME UNIVERSAL FLAT TURRET LATHE NO. 2

The machine is well adapted for either bar or chucking work. It will swing chucked work up to 20¾ in. in diameter, and can be furnished to take bar work up to either 2½ or 3½ in. in diameter. The turret has a longitudinal travel of 30 in. and a cross movement of 7½ in. All control levers are within easy reach of the operator. The all-geared-head, single-pulley drive provides twelve spindle speed changes from 18 to 318 r.p.m. The sliding gears are of heat-treated chrome-nickel steel. Changing speed can be accomplished by one continuous movement of one of the speed changing levers. As soon as gears are out of mesh, clutch is automatically disengaged, and then re-engaged after the gears are again in mesh.

The side carriage spans the ways of the bed, eliminating all overhang to the side turret and tools, is so made as to clear the chuck, and can be moved out of the way to permit the use of short tools in the main turret. The cross-sliding main turret revolves on a ground tapered stem of large diameter and is automatically locked in its various positions by means of a hardened and ground taper plunger placed directly beneath the cutting tool.

Power feed is provided in either direction for both side and main turrets, and longitudinal rapid traverse in either direction for the main turret. The side head has one adjustable stop and the main turret twelve longitudinal stops consisting of one independent stop for each position of the turret and six auxiliary stops. The latter are so arranged that, if desired, seven different shoulder lengths may be machined by first using an independent stop and then the six auxiliary ones. Cross-feeding is regulated by large diameter micrometer dials with observation stops.

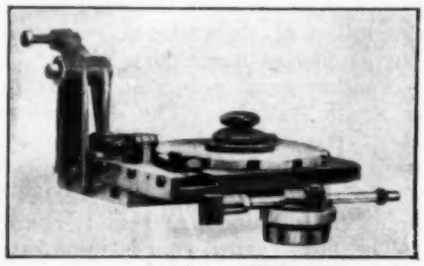
A thread-chasing attachment is regular equipment, and a taper turning attachment for the side head can be furnished on order. Arrangement is made for mounting a 5-hp. motor on the rear of the head-end leg, making a compact self-contained drive, or the machine may be run otherwise if desired. The machine occupies a floor space of 3 ft. 9 in. by 10 ft. 8 in. and weighs 5,000 pounds.

S & S Dial Feed for Punch Press

A line of dial feeds for attachment to punch presses has recently been placed on the market by the S & S Machine Works, 4522 Lexington St., Chicago, Ill. The feeding mechanism can be applied to any make and size of open-back inclinable punch press. It is applicable especially in the manufacture of electrical goods, radio equipment, hardware and small parts. The blanks, shells or parts being worked upon are carried under the punch to receive second or third operations. When desired, two or three consecutive operations can be performed with only one handling, and the operator's hands are not near the dies.

The dial feeds are built in seven sizes to suit various sizes of machines from small bench presses up to those weighing 8,500 lbs. The illustration shows the No. 2 size, which is one of the smallest; the larger sizes are similar in details of construction. The devices are furnished with crank disks bored to suit the press shaft, and they are arranged to bolt on the bed of the press, using the standard bolster bolts.

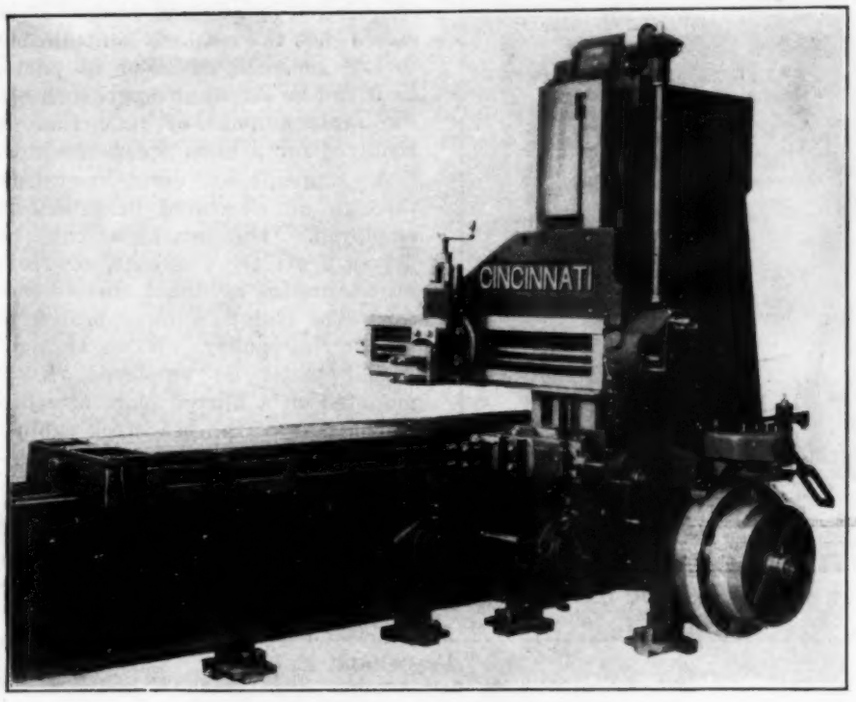
The radial and thrust bearing in the center of the dial plate has a special mounting to provide accuracy of feed and durability. The friction brake is adjustable by means of a hand locknut, which provides sensitive adjustment. The brake can be set to give the minimum amount of friction needed to bring the dial to rest. The locking dogs are thus not called upon to do duty as bumpers or stops for the dial, and they act merely as registering and locking members.



S & S DIAL FEED MECHANISM FOR PUNCH PRESS

Cincinnati 30x30-Inch Open-Side Planer

The Cincinnati Planer Co., Cincinnati, Ohio, has just put on the market a 30x30-in. open-side planer as an addition to the line originally described on page 725, Vol. 50 of *American Machinist*. The accompanying illustration gives a good idea of the rigidity and convenience of the entire design. The table is gibbed on the right side and is so fitted between the two V's that regardless of how much overhang there is to the work, the table will not tip nor be twisted out of its ways. However, for heavy work very much wider than the table an auxiliary support can be provided as an extra.



CINCINNATI 30X30-INCH OPEN-SIDE PLANER

The bed is closed between the V's and made very heavy on the right side, particularly on the housing cheek, where it is carried up several inches higher to provide ample bearing for the column which is tongued, doweled and bolted to it. The large box-type column is made with considerable taper to better resist the bending and twisting strains set up when the head is working at the extreme position on the crossrail and the stresses are at a maximum.

Rapid power traverse aids in placing the rail heads quickly in position without fatigue to the operator. This arrangement is stated to be foolproof, and it is ready for use at all times. Forced lubrication delivers oil into the V's of the bed directly under the tool point, and from here the oil is distributed over the entire length of the ways. This feature is especially desirable when working with extremely short strokes.

The table is of very heavy box type with the bottom entirely closed, and heavy ribs at short intervals tie the top and bottom sections together. The T-slots are planed from the solid and the center tee-slot extends the full length of the table. Stop holes are drilled and reamed throughout the entire surface of the table. By the use of extra holes at each corner of the table and the center slot running the entire length, work from 6 to 10 in. longer than the rated capacity of the machine may be planed. By having the bottom of the table closed, no dirt can fall through the holes onto the ways.

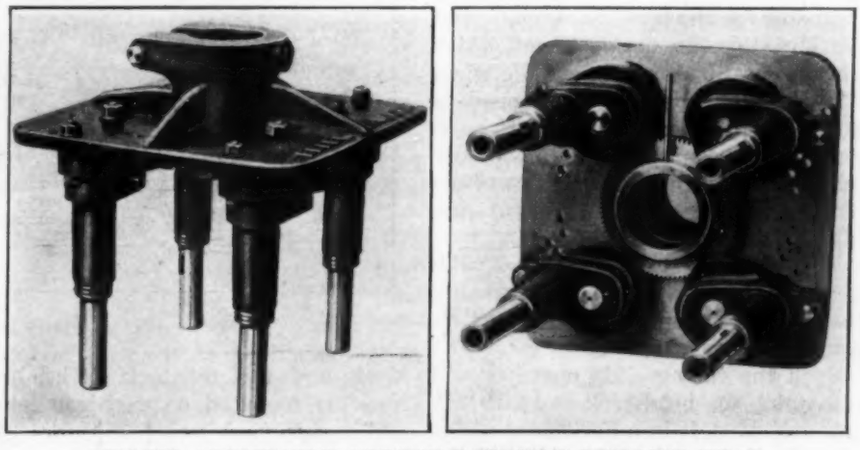
Herringbone gears are used for the first gear reduction on the pulley shaft end. All large gears and racks are made from semi-steel castings and the pinions from steel forgings. The quick reverse pulleys are of aluminum, the lightness of which reduces the amount of inertia at the moment of reverse. A special "tu-speed" countershaft is regularly furnished, and a variable-speed d.c. motor drive is recommended.

Sellew Adjustable Multiple-Spindle Drilling Head

A simplified form of adjustable-center drilling head has recently been brought out by the Sellew Machine Tool Co., Pawtucket, R. I. At the left of the accompanying illustration the machine can be seen in its normal vertical position, while the view on the right shows the construction of the drill-holding spindles and the means of changing their positions.

Each spindle arm is held in position by means of two bolts, one being permanent and about which the arm swings, and the other being a locating and clamping bolt that is removable. This latter bolt is inserted in the hole desired to give the correct set-up, and the arm with its spindle is then locked in place. The head illustrated was developed for drilling six sets of four holes each in the corners of different sized rectangles, such as the holes in the feet of small electric motor frames.

The body of the head is attached to the quill of the drilling machine, and the central driving gear is fitted on the outside of the nose of the drilling machine spindle. The head is made in several sizes, and to suit the special requirements of the work.



SELLEW ADJUSTABLE MULTIPLE-SPINDLE DRILLING HEAD

LeBlond Semi-Automatic Multi-Cut Lathe No. 12

A "Multi-Cut" semi-automatic manufacturing lathe for work up to 12 in. in diameter has recently been added to its line by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. In its essential features, the No. 12 machine is the same as the Multi-Cut lathe described in the 6 and 9 in. sizes on page 545, Vol. 51 of *American Machinist*. The machine, which is shown in Fig. 1, is made in various bed lengths to give maximum center distances of 18, 26, 34 and 42 inches.

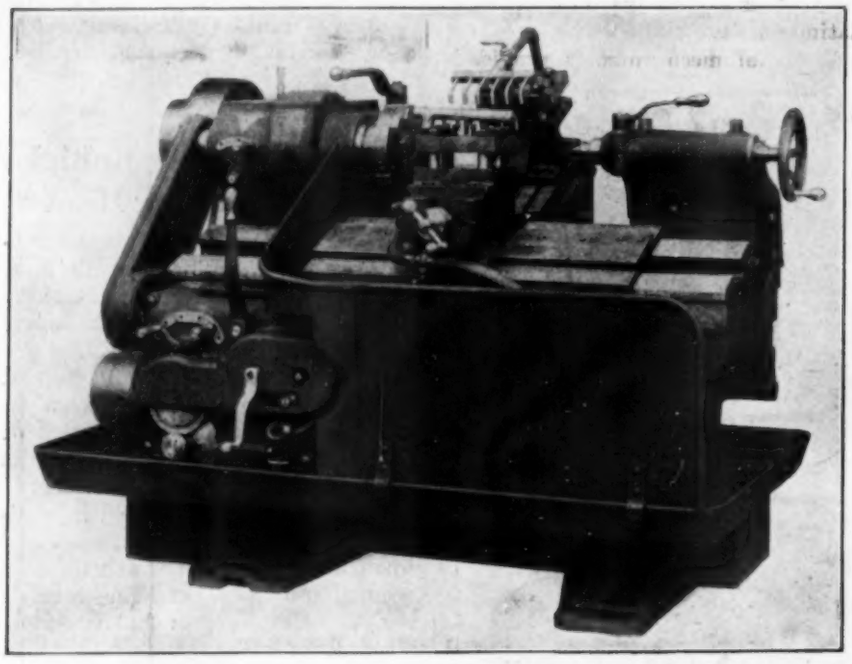


FIG. 1—LEBLOND NO. 12 MULTI-CUT SEMI-AUTOMATIC LATHE

Besides the difference in size between this machine and the former models, there are many features of construction that are not the same as those formerly employed. Of chief interest are the power rapid traverse for the turning carriage and facing slide, an arrangement which automatically stops the spindle when the feed of the tool is stopped, a submerged rotary pump with distributor lines that is automatically shut off when the spindle stops rotating, and the construction of the shears on the bed.

Regarding this last feature, the front shear, on which the turning carriage is mounted, is placed at an angle, whereas the rear shear, on which the facing slide operates and on which the headstock and tailstock are mounted, is in a horizontal plane. Due to the angular mounting of the turning carriage, it is claimed that the pressure of the cut keeps the carriage more firmly in position on the bed than when horizontal shears are employed. The turning carriage can be traveled past both the headstock and the tailstock. The bed itself is mounted on cast-iron legs, and a pan, tank and pump for cutting compound are furnished.

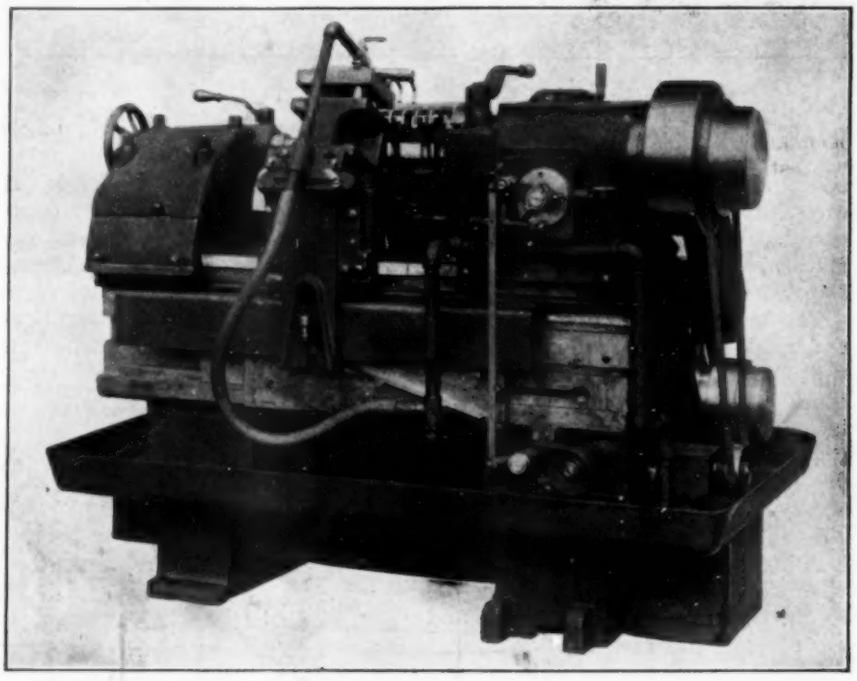


FIG. 2—REAR VIEW OF NO. 12 MULTI-CUT LATHE

The machine is ordinarily employed with multiple tools for simultaneously turning and facing such parts as gears, shafts, cone pulleys and automobile wheel hubs. Although the maximum turning capacity is for work up to 12 in. in diameter, the maximum facing capacity is 10½ in. in diameter. The machine is essentially a lathe, so that a lathe operator can care for it. No slides are operated by the use of cams, and change gears are employed to give the desired speeds and feeds. It is stated that the machine is applicable to lots as small as 25 or 50 parts, as it can be set up in approximately the same amount of time that is required for a hand screw machine.

A single-pulley drive operating through an all-geared headstock is employed. The machine can be driven from the lineshaft, or from an alternating or direct current motor. The clutch is incorporated in the driving pulley. When an individual motor is employed, it is mounted on a hinged plate attached to the rear of the headstock cabinet leg. The short driving belt is tightened by means of an idler pulley running on roller bearings. A motor of from 7½ to 15 hp. running at 1,750 r.p.m. is recommended. Although the higher power is not ordinarily required, the machine when connected to a large motor can be employed for very heavy turning operations with a large number of tools.

Both the feed and the rapid traverse movements of the carriage and slide are controlled by means of the hand lever on the feed box at the head of the machine. The controls are so interlocked that the feed and the rapid traverse cannot be engaged at the same time. The speed changes are made by the lever on top of the headstock when controlling the higher speeds, and by the lever on the front of the headstock for the slower speeds. The lever for starting the spindle can be seen at the right-hand end of the headstock. There are six speed changes for the headstock spindle made by means of nickel-steel, stub-tooth sliding gears. The gears are mounted on short shafts having four keyways, the corresponding keys being broached from the solid in the gears.

Stops are so arranged that the rotation of the spindle is stopped as soon as the feed of the turning carriage and facing slide is disengaged. This arrangement prevents the spindle from running idly after the cut is actually completed, and relieves the operator of close watch of the process. The spindle is provided with a ball thrust bearing. The entire headstock mechanism is inclosed in an oil-tight casing, and every gear and bearing is flooded with oil. It should be noted that all important points of the machine are provided with flood lubrication.

The top of the turning carriage is provided with a broad surface on which the toolrests for turning can be mounted. In the illustration two toolrests can be seen in position. Any of the rests may be equipped with a taper turning attachment, so that the machine can turn both straight and taper surfaces at the same time. The carriage is fed along the bed by means of a steel bull gear and a rack placed in the center of the shears.

The slide on which the facing tools are mounted is carried at the rear of the machine, and receives its motion from the profile plate planed on the rear of the bed, as shown in Fig. 2. The contour of this profile plate may be such that the facing tools are given the desired rate of feed and then dwell at the end of the cut while the turning tools continue, or it may be such that the speed of the facing tools gradually slows up as they approach the end of their cut.

The feed box through which the turning carriage and the facing slide derive their motion is equipped with nine basic feed changes obtained by the manipulation of two short levers on the front of the box. The changes are made by means of chrome-nickel steel sliding gears. The relative feeds of the turning carriage and the facing slide can be varied by change gears located on the feed box. After this ratio has been fixed by the use of certain gears, the feeds of both the motions can be varied by manipulating the levers.

A special mechanism is provided for disengaging the feed of the carriage and slide. A disk that makes one revolution for the complete travel of the carriage has on it dogs whose position may be varied to suit the length of stroke required. The action of a dog disengages a positive clutch, as well as actuates the automatic spindle stopping arrangement incorporated in the headstock. The rapid traverse motion is driven by means of a light belt from the main driving pulley.

The maximum travel of the carriage is 20 in. That of the facing slide is 5½ in., and of the turning toolrest 5½ in. The spindle speeds vary from 50 to 250 r.p.m. The feeds of the turning carriage and facing slide vary from 0.002 to 0.203 in. per revolution of the spindle.

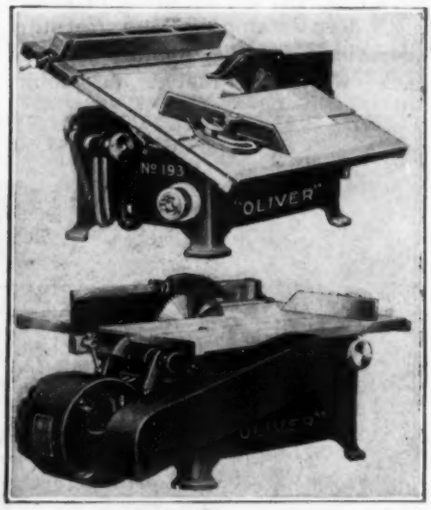
Oliver 7-Inch Motor-Driven Saw Bench No. 193

A motor-driven saw bench adapted to a wide variety of work and intended for bench mounting, has recently been placed on the market by the Oliver Machinery Co., Grand Rapids, Mich. This No. 193 machine is intended especially to be placed on the work bench close to the operator so that he can do small work without the necessity of going any distance to a large machine.

A special floor base can be provided, with knobs on the bottom to aid in moving it to the desired position. The machine is easily portable in either the bench or floor style. It has a capacity to cut 2 in. deep with a saw 7 in. in diameter, and to dado work up to ¾ in. wide when supplied with a 6-in. dado head.

The table, which measures 21x24 in., is grooved for the sliding cut-off gage. The ripping gage is of substantial design and can be quickly locked in position by means of a knob. The accompanying illustration shows in the top view the table tilted at an angle. A graduated dial serves to indicate the angle of tilt, an angularity of 45 deg. being obtainable. A stop is provided so that the table can be easily located in the horizontal position.

The saw arbor runs on ball bearings. It is regularly driven at about 5,000 r.p.m. by a ½-hp. motor running at a speed of 1,800 r.p.m. The yoke carrying the saw arbor is hinged so that the saw can be quickly raised



OLIVER 7-INCH MOTOR-DRIVEN SAW BENCH NO. 193

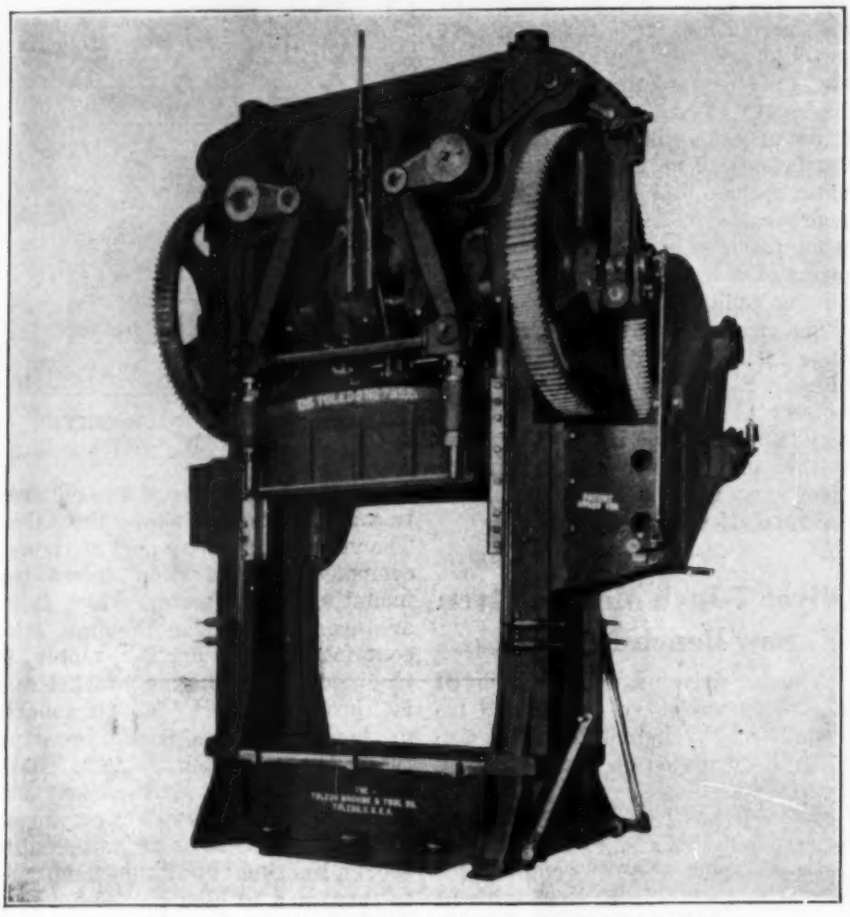
and lowered by means of a hand lever to vary its height above the table. The view at the lower part of the accompanying illustration shows the mounting of the motor, which is so arranged as to make the unit self-contained. The driving motor is mounted on a swinging bracket and is provided with a turnbuckle mechanism for raising and lowering the motor to tighten the belt. Both the saw and the driving belt are guarded. A snap switch is employed, while if the motor is to be operated from a lighting circuit sufficient cord is furnished to give connection to a convenient lamp socket.

The cut-off gage may be used on either side of the saw. It may be set at any angle and is arranged to receive a wooden face piece. The saw guard is adjustable vertically to allow for variation in the thickness of the stock. The splitter guard is fastened to the table back of the saw to keep the stock from pinching the saw after passing over it.

The machine is only 10 in. high, with the table in the horizontal position. However, when mounted on the pedestal, the table is 32 in. above the floor. Crated, the bench machine weighs 200 lb., and 300 lb. equipped with a floor base. The weights boxed are, respectively, 300 and 400 lb., with 5 and 10 cu.ft. of contents.

Toledo Double-Crank Toggle Drawing and Deep-Stamping Press

A toggle drawing and deep-stamping press has recently been placed on the market by the Toledo Machine & Tool Co., Toledo, Ohio. The press is made in a variety of sizes, a large one of which is illustrated herewith. It is intended for all kinds of drawing, deep stamping and forming operations in the manufacture of such work as metal automobile bodies, cowls, fenders and hoods.



TOLEDO DOUBLE-CRANK TOGGLE DRAWING PRESS

The features of the machine to which the maker calls attention are the smoothness of action, the exact timing that can be obtained, the dwell on the movement of the blank-holder slide, the high-speed, and the small floor space due to making the machine self-contained with the gearing mounted on the uprights with no outside slide nor out-board bearings.

Two trains of machine-cut gearing serve to drive the machine. The large twin gears at each end of the crankshaft operate the inner slide or drawing plunger in the usual manner. The outer or blank-holder slide is operated by cranks with universal connections on each of the twin gears on the crankshaft. Each crank is connected by a steel link to a lever mounted on each end of the crown, which is of heavy double-web cross-section, so that large steel shafts can be run from the front to the back of the crown. On the shafts are mounted levers which connect with links controlling the toggle mechanism that operates the blank-holder slide.

The toggle arms and levers are made of steel with bronze bushings at each shaft bearing. When the toggle is straightened out, the entire pressure on the blank holder is held directly through the frame of the press, so that power is not required from the crankshaft.

A friction clutch enables the operator to start or stop the machine at any point of the stroke. A power elevator for the plunger slide is furnished, as is also a force-feed lubricating system to oil all the main bearings from the floor.

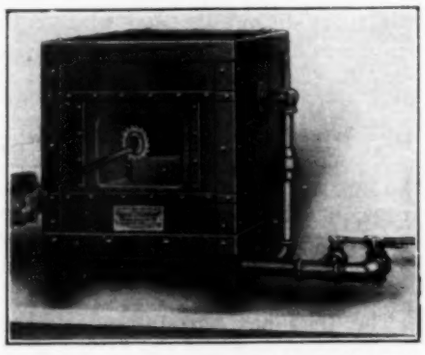
Midget Universal Heat-Treating Gas Furnace

The Fitzgerald Forging and Heat-Treating Co., 576 St. James Ave., Springfield, Mass., has recently placed on the market its "Midget universal" gas furnace for general heat-treating work. The furnace is suitable for heat-treating both high-speed and carbon tool steels, and a considerable saving in time, fuel and labor is claimed for it by its maker. No separate furnace is required for preheating, as a space 4 to 6 in. wide and 4⅞ in. deep is provided at the front of the furnace where tools may be preheated to approximately 1,500 deg. F. before passing them into the heated chamber.

The speed with which the proper heat can be obtained is a feature of the furnace. It is stated that only 20 min. are required to heat the furnace from a cold start to a temperature suitable for treating high-speed steel. This speed of heating should save time on the part of the operator when the furnace is put to emergency use and in departments where the furnace is not run continuously.

The fuel consumption is stated to be low, as only 275 cu.ft. of gas are required per hour to maintain a temperature of 2,400 deg F. Complete combustion is claimed, with the absence of scaling, pitting or wasting away of the work. The furnace can be employed for heat-treating taps and dies, because of the lack of injurious effects on the work. It is fitted with four burners so located as to make a very compact unit.

The roof of the heating chamber is arched to prevent the formation of cold pockets. The chamber is about 6½ in. wide, 7 in. high and 9 in. long, and the front opening to it is 4 in. wide and 4⅜ in. high over the floor tile. Since the floor tile can be removed, an opening 6¼ in. high may be obtained. It is stated that high-



MIDGET UNIVERSAL GAS FURNACE

speed cutters 4 in. in diameter and over 3 in. long have been successfully heated.

There is provision made at the rear of the furnace for inserting a pyrometer couple. A removable plug at the rear allows for heating long tools. The furnace is incased in a steel frame and is approximately 14 in. wide, 15 in. high and 18 in. long.

Kron Portable Electric Hammer

A hand-portable riveting hammer operated by electric current has recently been developed and placed on the market by the American Kron Scale Co., 430 East 53d St., New York, N. Y. The motor of the device can be supplied for either 110 or 220 volts, to suit the type of current available. It is universal and adaptable to either direct or alternating current. The hammer can be run from a lighting circuit, which makes it adaptable to use in practically any location where electric current is available. Its convenience for work to be performed where compressed air is not available, is particularly stressed by the maker, as a compressor is not necessary.

The hammer is intended for driving rivets up to ½ in. in diameter, or drilling concrete with drills up to 2 in. in diameter. It is stated that only 7 to 10 sec. are required for hammering a ½-in. rivet head, and that a ¾-in hole can be drilled in concrete at the rate of 6 in. per minute, and in granite at 3 in. per minute. The ability to drill in concrete makes the tool adaptable to use when installing electrical wiring and fixtures in new buildings.

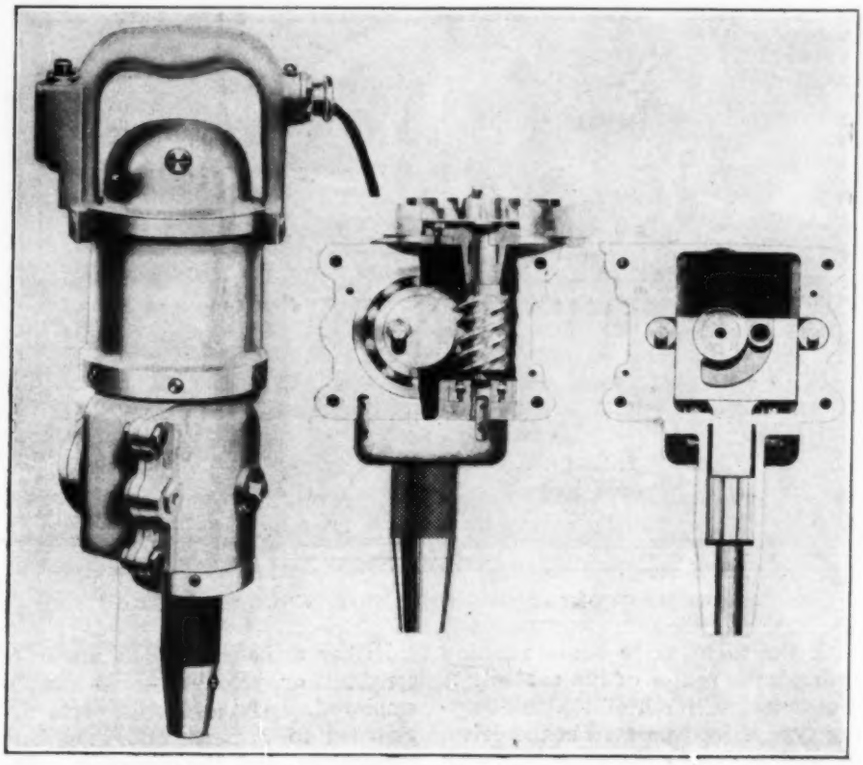
On the left of the accompanying illustration the assembled hammer is shown. The other two views show the driving parts of the hammer as disassembled, to illustrate the method of operation. By referring to the view on the right of the illustration, it can be seen that the hammer itself has at its upper end a widened portion in which is cut a cam groove for a roller by means of which motion is imparted to the hammer. The reciprocating mechanism weighs complete 1½ lbs., and is given a stroke of 1¼ in. It is guided by ways and rollers at the upper end, and the lower end runs in a cylindrical bearing in the nose of the device. The rivet-set or chisel used in the hammer is struck in much the same way as in existing types of riveting hammers. Should the tool become displaced, the reciprocating hammer strikes a positive stop at its lower position, so that no injury is done to the driving mechanism.

The reciprocating motion of the hammer is derived from the rotation of the eccentric pin shown on the worm wheel in the view at the center of the illustration. The roller on this pin fits in the cam groove in the upper end of the hammer. Rotation of the worm gear causes the small roller when moving upward to contact with the large roller that forms one side of the cam groove, and to draw back the hammer. Due to the rolling action, there is but little friction. Further rotation causes the eccentric pin when moving downward to engage with the bottom of the cam groove and to drive the hammer forward. When the hammer is at the bottom of its stroke, the pin is only half-way down on its travel and rests in the position shown at the right.

It can be seen that the pin at this point is absolutely disengaged from the reciprocating hammer, so that it does not receive any of the shock. This feature is of particular importance, since none of the blow is transmitted through the mechanism to the motor. It should be noted that the motor cannot be overloaded, no matter how much pressure is placed on the hammer to hold it against the working tool. The motor continues to run and the hammer to reciprocate at the same speed without regard to the pressure placed on the device. The normal speed of the motor is 6,500 r.p.m., and of the hammer 1,600 strokes per minute.

The motor drives the worm through a special coupling. At its upper end the worm shaft runs in a bronze bearing, and at its lower end in a combination radial and thrust ball bearing. The shaft carrying the worm wheel and driving pin runs in ball bearings. The case containing this driving mechanism is packed with heavy oil. The construction is such that the oil cannot reach the motor, the bearings of which are independently oiled. A pan on the lower end of the armature causes air to be drawn through the motor from above and expelled at the bottom of it. The switch is of the snap type, and automatically disengages when the lever is released by the operator.

The driving mechanism and working parts are made of chrome-vanadium steel. The housing and handle are made of either aluminum or some light and strong alloy. The tool is assembled in units and can be readily disassembled. The overall length of the hammer is 20 in. and the weight is 26 pounds.



KRON PORTABLE ELECTRIC HAMMER AND DRIVING MECHANISM

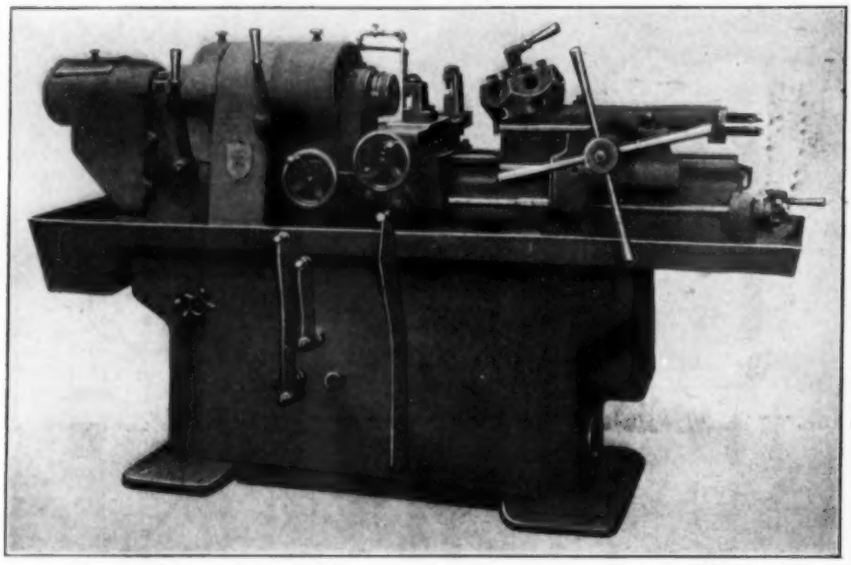
Wood Self-Contained Motor Driven Turret Lathe

In order to provide a self-contained turret lathe adaptable to a wide range of conditions and taking up no more floor space than the ordinary belt-driven machine, the Wood Turret Machine Co., Brazil, Ind., has recently developed the machine shown in the accompanying illustration. The turret lathe or screw machine is mounted on a cabinet base, and the driving motor is mounted on the rear cover plate inside the cabinet. Removal of this plate removes the motor with it.

A silent chain connects the motor with the main drive shaft running through the center of the cabinet. A cone friction clutch of the full-floating type is incorporated in the drive, as well as a change gear box with the gears running in oil and giving six changes of spindle speed on the plain head machine. Where a friction back-gear is used, twelve changes of speed are obtainable. In addition, a reverse is provided for every forward speed, by means of a reversing gear that runs in oil.

The drive from the gear box is by means of a 12-in. pulley connected to another 12-in. pulley on the spindle, with a belt tightener arranged between them. The machine thus provides the features of belt drive, as well as those of an all-geared-head, single-pulley drive. No overhead shafting, hangers, pulleys nor belts are necessary. It should be noted that the pull of the belt is always down on the headstock instead of up against it as when overhead belt drive is employed. The machine can be moved to the most convenient position and the feed wires connected to the motor.

All the controls are centralized in the operating position at the front of the machine. The knob shown at the left of the front cover controls the belt tightener. The two shorter hand levers control the speed changes, and the long hand lever controls the starting, stopping and reverse. Removal of the cover plate which extends entirely across the front of the cabinet, exposes to full view the motor and the drive units. Air holes in both ends of the cabinet provide for circulation of air.



WOOD SELF-CONTAINED MOTOR-DRIVEN TURRET LATHE

Either a d.c. or an a.c. motor of constant or variable speed can be employed. All revolving parts are guarded to prevent injury to both themselves and the operator. The machine may be driven by belt as a single-pulley machine by mounting a jack shaft on the rear cover plate, in place of the motor.

Clough Vertical Milling Machine with High-Speed Attachment

A vertical milling machine adapted to high-speed milling and recently placed on the market by R. M. Clough, Meriden, Conn., is shown in Fig. 1. The machine is the same as the regular No. 1 milling machine made by the concern, except for the attachments that have been applied to it. Handwheels are fitted on the table screw and cross screw instead of ball handles. A treadle controls the feed, and the stop gage for the spindle is placed on the sleeve above the head instead of on the spindle.

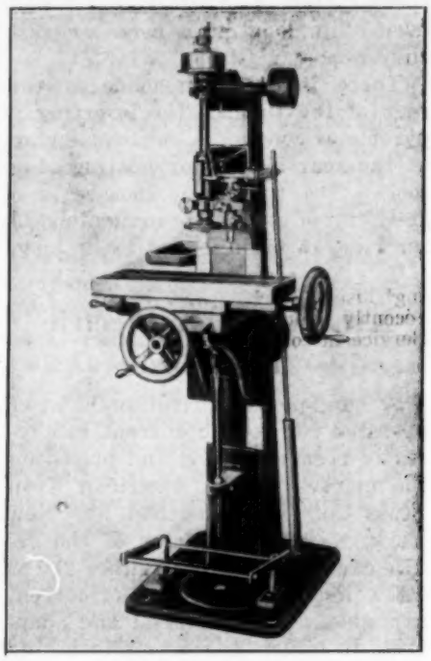


FIG. 1—CLOUGH VERTICAL MILLING MACHINE

The high-speed milling attachment itself is better shown by Fig. 2. This attachment is clamped on the lower end of the spindle sleeve and can be put on or taken off in less than 2 min., so the maker states. It is driven by a round belt running in a V-groove pulley mounted on the spindle, which is hardened and runs in babbitt bearings that are adjustable to take up wear. The speed is four times the speed of the spindle of the machine, so that 5,000 to 10,000 r.p.m. are available. Means are provided to take up stretch in the belt. The spindle has a draw-in rod, and a small watch or rivet chuck is used to hold milling cutters $\frac{1}{8}$ in. or smaller in diameter.

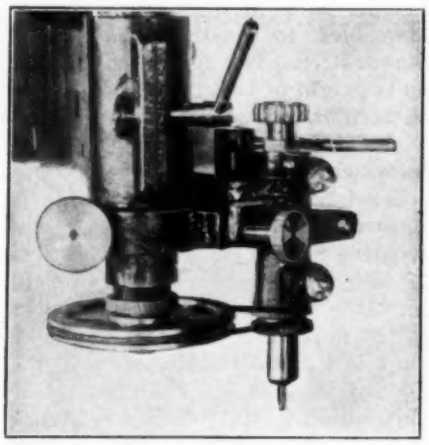


FIG. 2—CLOUGH HIGH-SPEED MILLING ATTACHMENT

News Section

Westinghouse Veterans Hold Memorial Service

The veteran employees of the Westinghouse Electric & Manufacturing Co. recently held their annual Memorial Service in commemoration of the members of their association who have died.

For the convenience of a great number of men and women who are members of the association but who are employed in other plants than that at East Pittsburgh, the entire service was broadcasted by radiophone through the Westinghouse Station KDKA. The music for the service was given by the Westinghouse Community Chorus of seventy voices, which is made up of men and women employed at the East Pittsburgh Works. After an invocation prayer and reading from the scripture, E. H. Sniffen, Manager of the Power Sales Department of the Company and a member of the Veterans Association, gave the memorial address.

Gives Insurance Policies to Employees

An insurance policy with premiums paid was a Christmas gift which was received by each employee of the Master Electric Co. of Dayton, Ohio.

The insurance policies given by the company range from $500 up and are with an old line insurance company. A feature of the gift is that the policies will be increased each succeeding year to a limit of $2,000 and all premiums will be paid by the company while the employees remain with the organization.

In presenting the policies, E. P. Larsh, president of the company, announced the initiation of a nursing service which will provide nurses free of charge to employees who are ill during their employ with the Master Electric Company.

Mr. Larsh stated in discussing the gift to each employee, "It is an expression from this company of our appreciation for the faithful service which all of our employees have rendered. Our growth has been unusually rapid and we feel that much of what we have been able to accomplish we owe to the hearty co-operation of our employees. Therefore we are taking this Christmas season as a fitting time in which to express our appreciation in this way."

Merger of Bolt and Nut Companies Is Announced

A merger of four large bolt manufacturing concerns was consummated by Justin C. Burns and a syndicate of Columbus men identified with the Standard Bolt and Nut Co. of Columbus. The concerns included are the Standard Co., of Columbus, the Michigan Bolt and Nut Co., of Detroit, the Bayonne Bolt and Nut Co., Bayonne, N. J. and the Boss Nut Co., Chicago. The Michigan plant is one of the oldest in the country.

The name of the new corporation will be the Standard Bolt Corporation, organized under the laws of Delaware with a capital of $5,000,000 preferred stock and 55,000 shares of no-par common stock. J. Rich Steers, formerly president of the Bayonne plant is president; Justin C. Burns is chairman of the board and Harley E. Burns of Columbus is secretary-treasurer. The physical value of the four plants is in excess of $6,500,000.

Exports in November Heaviest of the Year

American exports in November reached the highest point of the year, according to official overseas trade statistics made public last week by the Department of Commerce, showing an export business totaling $383,000,000.

The November total is $12,000,000 greater than the value of October exports and $90,000,000 greater than the value of commodities shipped abroad in November last year. In comparison with November, 1913, the increase was more than $138,000,000.

A brief statement by the department declared that the November returns showed that American agriculture and industry generally benefited from the increasing export business. Detailed analysis of the trade, however, has not been made by the department.

The exports of the United States for preceding months this year and for November in a series of years are as follows:

Nov.	$383,000,000	Nov., '21.	$294,092,219
Oct.	372,000,000	Nov., '20.	676,528,311
Sept. ...	313,093,286	Nov., '19.	740,013,585
Aug. ...	301,779,541	Nov., '18.	522,236,594
July	301,157,335	Nov., '17.	487,327,694
June	335,116,750	Nov., '16.	516,167,324
May	307,568,828	Nov., '15.	327,670,353
April ...	318,469,578	Nov., '14.	205,878,333
March...	329,979,817	Nov., '13.	245,539,042
Feb. ...	250,619,841	Nov., '12.	277,898,681
Jan.	278,848,469	Nov., '11.	201,608,429

Fatigue of Metals Research by General Electric Co.

E. L. Robinson, steam turbine engineer of the General Electric Co., Schenectady, N. Y., has returned from a visit to the college of engineering of the University of Illinois, Urbana, Ill., on business pertaining to the fatigue of metals investigation which has been carried on by the engineering experiment station of the University. The General Electric Co. is particularly interested in the fatigue of metals investigation on account of its need of a metal which will be of sufficient strength to withstand the strain of vibration to which it is subjected in parts of the steam turbine. So far no metal has been found of sufficient strength to prove successful in the large turbines.

The General Electric Co. has alloted $37,500 to the University of Illinois to continue the investigation, which thus far seems successful, the research being in charge of Prof. H. F. Moore.

Changes in General Electric Manufacturing Departments

In several announcements issued today by vice president G. E. Emmons, a reorganization of the general manufacturing department of the General Electric Co. is proclaimed. This reorganization, which is effective January 1, 1923, includes the appointment of H. F. T. Erben, heretofore manager of the Schenectady Works, as vice chairman of the manufacturing committee and ranking a member of the general manufacturing staff.

The vacancy thus created in the position of manager of the Schenectady plant is to be filled by the advancement of Charles E. Eveleth, who has been serving since Sept. 1 as assistant works manager under Mr. Erleen. Mr. Eveleth will become works manager. Mr. J. A. Smith will continue as general superintendent and in the absence of Mr. Eveleth will be in charge of the works.

The membership of the manufacturing committee and the appointment of a sub-committee to be known as a committee on appropriations, is also announced. The general manufacturing department of which vice president Emmons is in charge will be as follows: H. F. T. Erben, vice chairman of manufacturing committee and ranking member of the staff; J. T. Broderick, secretary of the manufacturing committee; L. G. Banker, general purchasing agent; M. C. Fitzgerald, manager of transportation department; W. C. Fish, manufacturing engineer; W. B. Curtiss, supervisor of production; G. S. Maxwell, supervisor of costs; E. Z. Steezer, supervisor of industrial relations.

Fate of Federal Employees in Doubt

Although several hearings have been held by a subcommittee of the Senate appropriations committee, the final report on the bill to re-classify the employees of the federal government and readjust salaries has not been formed and in view of the heavy work devolving upon the appropriations committee because of the annual supply bills fears are expressed that the reclassification measure will not be brought to action on the floor in time to assure passage at the present session of congress.

Senator Smoot, chairman of the subcommittee in charge of the bill, has stated however that a report may be expected shortly.

Friends of the reclassification bill are dubious of its passage in the present Congress even with a report coming in January because of the doubt over the shape in which the bill will appear when it does come from the appropriations committee.

The civil service committee of the Senate considered this measure some weeks and reported it with a recommendation that it be passed on Feb. 8.

Looking Backward and Forward at New Year's

A Review and the Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Director, *Commerce and Finance*, New York

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AS THEY face the complexities and problems of the New Year there may be some who feel that we have hardly more than held our own during the twelve months just ended, but their discouragement is unwarranted. Life is just one thing after another, but the record of 1922 is one of recovery and reconstruction both here and abroad.

A year ago we were in the depths of the depression caused by what some regarded and still regard as an unnecessarily precipitate deflation. In the interval many frozen loans have been thawed out and the bankers of the country deserve a word of thanks for the good judgment and consideration they have shown in nursing back to commercial convalescence many concerns who would have been speedily thrown into bankruptcy if the policy which formerly prevailed had been followed. Considering the magnitude of the losses incurred the number of failures that have been reported is remarkably small.

Encouraging Recovery in Values

The recovery in values recorded is also encouraging. Comparing present prices with those of December 31, 1922, wheat is up about 25 cents, corn 23 cents and oats about 10 cents a bushel. Cotton has advanced nearly 8 cents, sugar 2 cents, coffee 2 cents and beef and hog products an average of fully 2 cents a pound. Iron and steel are up an average of almost $10 a ton. Lead has nearly doubled its value, and copper, though a laggard among the metals, is nevertheless one cent a pound higher than a year ago.

The index numbers, which are an average of essential commodity prices weighted with relation to the proportion in which they are factors in the cost of living, compare as follows for the United States and Great Britain. It will be noticed that the average in the United States on December 1, 1922, was 54 per cent above the prewar level and 12.7 per cent higher than it was a year ago, while the English figures were 3.93 per cent lower on December 1, 1921, but 68 per cent higher than on July 1, 1914.

Here is the comparison:

	Dec. 1, '22	Dec. 1, '21	July 1, '14
Dun's, U. S...	185.462	164.531	119.708
Economist's, British	4.283	4.458	2.549

The decline in the British average during the twelve months is in part due to the advance in sterling exchange, but even making allowance for this it would appear that the price level is nearer normal here than in the only other important country that has been able to maintain the integrity of its currency.

And in another respect the comparison is in favor of the United States. In Great Britain as here there was much unemployment at the beginning of the year, but there is none here now, whereas in England the government is seriously considering a plan that will accelerate the emigration of the many for whom it seems impossible to provide work and for whom there is work aplenty in many other countries of the world.

Four Major Domestic Problems

There are many other aspects in which our record shows progress. Our exports have been amazingly large when the impecuniosity of the European world is considered. Billions of new bonds, including some large foreign issues, have been readily placed at rates which have progressively favored the borrowers and have been reflected in higher prices for government bonds and all good investment securities.

There remain, it is true, a great many maladjustments to be corrected and it is now generally agreed that some of the legislation that was designed for their correction will fail of its purpose, but upon the whole we are much better off than we were a year ago and it seems almost certain that 1923 will show further progress unless we are entirely blind to the lessons of experience.

In so far as our internal affairs are concerned there are four major problems upon whose solution and the promptitude with which it is found the continuance of our recovery is dependent.

They are:

1. The disparity between agricultural profits and the farmer's cost of living.
2. The high cost and inadequacy of railroad transportation and the apparent inability of most railroads to earn a fair return upon the capital invested.
3. The provision of a sufficient coal supply at a price that is reasonable from the consumer's standpoint and consistent with a living wage for those by whose labor it is produced.
4. A reform in both the State and Federal tax laws that will make them less inquisitorial and assure the necessary revenue while distributing its burden more equitably and diminishing the inducement to legalized evasion.

There are many other minor domestic problems but these four are supremely important and as they are disposed of most of the others will disappear.

Future Full of Promise

To despair of their solution is to despair of the intelligence of the most intelligent democracy that the world has known and to such a counsel of dejection in regard to the future of his country no American who knows anything of history will give heed for a moment.

When we turn from internal affairs to our external or international relationships there is equal reason for a philosophic confidence in the future and the ultimate wisdom of the American people. Since the armistice we have passed from the heights of international altruism to which we were exalted by the sacrifices of the war to the depths of national self isolation into which we were carried by the deflation which froze not only our credit but our sympathies for a war worn world.

But as our prosperity has returned we have begun again to realize that neither men nor nations can live unto themselves alone and that in an age in which the world has become an economic unit it is folly for the most important integer in that unit to insist that it is not part of the whole.

There is therefore developing afresh a half reluctant willingness if not an affirmative disposition to assume the responsibilities which our economic eminence has thrust upon us. The most hopeful sign of the times is the aggressiveness with which some of those who opposed the League of Nations are now insisting that the United States shall take the leadership in organizing an economic conference to consider "How we can help."

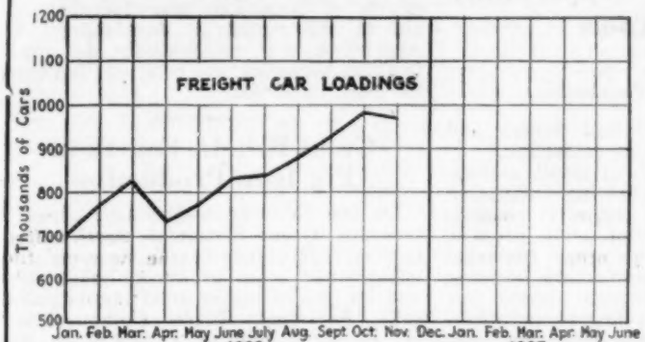
Bright Outlook for 1923

That this insistence is based upon considerations of self-interest; that, to quote the words of Senator Borah, it is in part prompted by the fact that "Millions are dying in Europe for the products which are rotting on our farms," makes no difference. It is an admission of the truth that there is a community of interest between all the peoples of the earth, and once this truth secures the recognition which inspires action we shall be well on the way to that cooperation that is the antithesis of war and essential to constructive progress and prosperity and which will be reflected by substantial business expansion in our own foreign and domestic commerce.

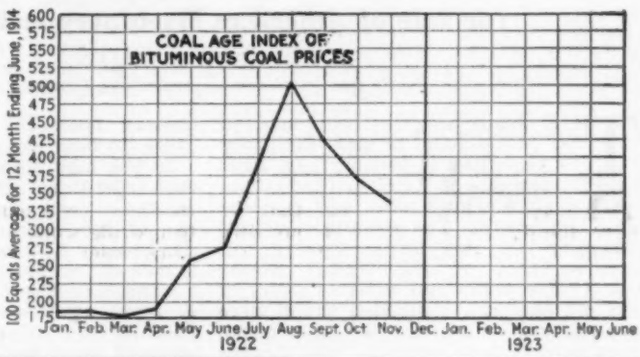
Therefore the auguries of the New Year seem to be highly favorable. The one thing to be feared is that we may become the victims of our own enthusiasm as the power we possess is revealed to us. If we use it wisely and with self restraint in exacting profit from its exercise the year 1923 may usher in a period in which the growth of wealth will exceed that of the century which followed the invention of the steam engine, the cotton gin and other epoch-making inventions in the world's industrial evolution.

But if we become intoxicated with our own success, if as often in the past we forget that industry and increased production at a reduced cost are the essentials of prosperity, if we surrender ourselves to the delusion that we shall grow rich rapidly if we can demand and obtain higher wages for less work and higher prices for a smaller output, then the brilliant future which appears to be in sight will prove to be but a dream from which we shall awake to find ourselves again in the slough of despond.

Weekly car loadings of revenue freight based on reports from the railroads of the U. S. by the Car Service Division of the American Railways Association.



Coal Age Index of Bituminous Coal Prices, f.o.b. mines, the average of spot prices from July, 1913, to June, 1914, being taken as the base.



FREIGHT car loadings dropped off slightly during November with an average weekly loading of 968,429 cars for the month as compared with 992,219 in October. Beginning with 994,827 cars loaded for the week ending Nov. 4, there was a gradual decrease each week, the loadings reaching 955,495 cars for the seven-day period ending Nov. 25. Loadings of coal, grain and merchandise continue heavy, the decline in November from the high October average being due to the holidays.

Automobile production for November exceeded expectations, a total of 232,000 cars and trucks being produced as against 238,514 in October. This was only 6,000 less than that month's output but 26,000 more than the total for September. The November production brings the total car output for the eleven months of 1922 up to approximately 2,345,000, and prospects are that the full year will show a production of 2,550,000. A general shortage of closed models is reported and a somewhat stronger demand for open types has resulted as a consequence.

Bituminous coal prices, as indicated by *Coal Age* index, continued their downward movement during November from the high point reached in August. The index for November was 339 as against 370 in the month previous, the spot prices for the same periods standing at $4.11 and $4.48 respectively. Continued mild weather during the month, a shortage of cars and a lack of demand for steam coal have been contributing factors in the price decline.

Comparative Prices of Shop Supplies

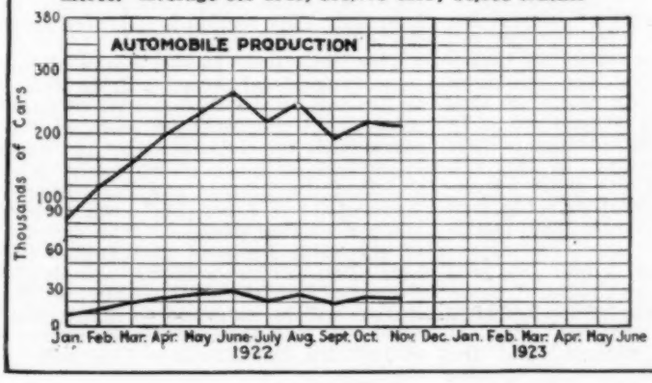
Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0295	$0.0295	$0.0273
Cold finished shafting	per lb	0.0378	0.0378	0.0373
Brass rods	per lb	0.171	0.1700	0.15
Solder (½ and ½)	per lb	0.24	0.23	0.20
Cotton waste	per lb.	0.11	0.11	0.122
Washers, cast iron (½ in.)	per 100 lb.	4.33	4.33	4.33
Emery, disks, cloth No. 1, 6 in. dia.	per 100	3 11	3.11	.....
Lard cutting oil	per gal.	0.59	0.575	.....
Machine oil	per gal.	0.36	0.36	.....
Belting, leather, medium	off list	30-10% @50%	40-5% @50%	
Machine bolts up to 1 x 30 in.	off list	55% @60%	50%@ 65-10%	50%@ 60-10%

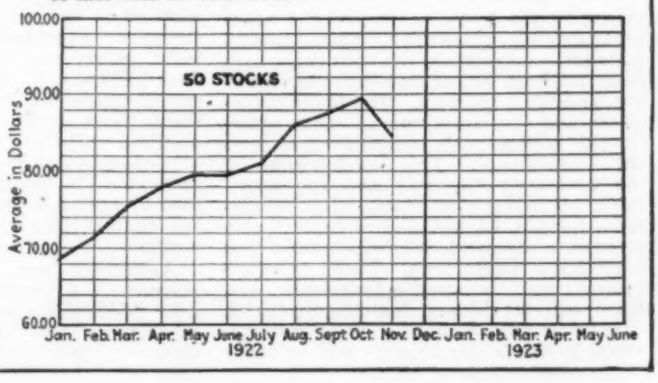
Share markets in New York, as reflected by daily compilations made by New York *Times Annalist*, show a continuance of the downward movement during the month, the average price of 50 stocks, 25 rails and 25 industrials, reaching $84.84 as against the October average of $89.88. The high point during the month was on Nov. 4, with an average of $88.44 from which mark prices declined to an average of $81.07 on Nov. 25. The entire market has shown a marked weakness since the high peak average of $91.32 reached by the 50 issues on Oct. 21, due chiefly to the absence of interest on the part of the public.

Skilled metal workers are scarce and rates are high. In the New York district tool makers are being paid 75, bench hands and lathe hands 60 cents per hour. Philadelphia reports a range of rates which is wider and somewhat higher, toolmakers receiving from 75 to 90, bench hand 65 to 85 and lathe operators 75 to 85. The Detroit district range for toolmakers is between 75 and 80, bench hands 50 to 55 and lathe operators 70 to 75 cents per hour. Cleveland reports show toolmakers' rates ranging between 50 and 75, bench hands between 40 and 60 and lathe operators between 55 and 65. Employment in the metal trades during 1922 shows a gain of about 15 per cent with payroll increases aggregating 20 per cent.

Passenger cars and trucks, production based on figures compiled by the Bureau of Foreign and Domestic Commerce. Average for 1919, 138,138 cars; 26,364 trucks.



New York Times Annalist combined average price of 25 railroad and 25 industrial stocks based on weekly averages of last sale in each week.



Industrial Progress in Argentina

Latin-American Industries Developing Rapidly—Opportunity for Sale of American Machinery and Tools

By GEORGE S. BRADY
American Trade Commissioner to Argentina, Uruguay & Paraguay

THE steady progress being made in the development of manufacturing in Argentina is opening up a large field for the sale of American industrial machinery, machine tools, and machine shop equipment. The present industrial tendency of Argentina greatly resembles that of the United States twenty-five years ago when so many of the old one-man controlled shops were gradually giving place to the modern organized factory systems. But Argentina manufacturers have the advantage of being able to learn from the past experiences of American and European factories, and the progress, therefore, should be more rapid.

Almost every kind of manufacturing is now carried on in Argentina. Complicated mechanisms such as typewriters have not been attempted by any of the factories, but there are numbers of moderate-sized well-equipped plants making scales, valves and fittings, toys, automobile accessories, storage batteries, marine motors, and a score of other things. Two large steel mills in Buenos Aires with about 1,000 employees each, devote themselves to the rolling of bars, wire drawing, and the fabrication of structural steel. Even steel shipbuilding has been attempted on the River Plate, and one shipyard at Buenos Aires constructed an all steel ship of 1,350 net registered tons.

New Industrial Development

An example of the rapid development of an industry in Argentina, and the manner in which new markets can be opened for American industrial machinery is found in the manufacture of shoes. A few years before the war Argentines were wearing imported shoes or those made by hand in the cobbler shops of Buenos Aires. An American shoe machinery manufacturer started propaganda and installed modern machinery in the first factory. Today there are forty shoe factories of importance in the Republic with productions ranging from 200 to 3,000 pairs of shoes daily, and practically all shoes now worn in the country are native made. A similar development is now taking place in the woolen industry, and Buenos Aires will one day be one of the great woolen centers of the world.

Other industries that have been developed on a large scale are the manufacture of glassware, hats, paper, matches, cigarettes, furniture, soap, flour milling, sugar milling and refining, and fruit canning. The large breweries and bottling works have purchased considerable quantities of foreign machinery. The development of the creamery business and the vegetable oil industries, especially cottonseed, linseed, castor, and olive, has also created a demand for machinery and mechanical equipment. There is much competition between American and European machinery manufacturers in supplying this demand. It is not unusual to find a large paper mill or other industrial plant equipped with machinery from the United States and three or four European countries.

In the manufacture of small articles the Argentines are showing surprising alertness, and their activity reminds one of the early notion shop of New England. As soon as an imported article of simple manufacture becomes a success on the Argentine market, one or more small shops begins to manufacture. In this way there are hundreds of small factories in Buenos Aires actively engaged in the manufacture of buttons, sheet metal ware, cheap hardware, pins, school slates, chalk, perfumes, paints, and dyes. Most of the manufacturers of an article like shoe polish make their own containers, but there are factories specializing in the manufacture of tin containers and paper boxes of all kinds.

Machine Tool Market Expanding

One of the best markets for machine tools and for such supplies as files is found in the railway shops. Argentina has 23,000 miles of railroad, besides the hundreds of miles of narrow gauge railway used for feeder and development lines. One quebracho company alone has 200 miles of narrow gauge railway extending through its forests. Nearly 4,000 miles of the railroads belong to the Argentine government, and the national railway administration operates two fine modern machine shops and foundries for the repair of cars and locomotives. The 16,000 miles of British owned railroads also have no less than ten large shops, and the electric street railways of Buenos Aires and other cities each have large repair shops. Several of the railway shops have built complete cars, and are equipped to do the most extensive repairs to locomotives. Their great distance from the car and locomotive builders have necessarily made them very resourceful, and during the war they were called upon to meet difficult situations. The administrative offices of the British owned railways are in London, and the natural tendency is to purchase British made supplies, but they are constantly buying in the American market whenever price and quality are attractive.

Great Oil Field Development

The development of the Argentine oilfields is opening another market for American machinery. On the government petroleum reservation at Comodoro Rivadavia there are extensive shops capable of repair work on anything from drills to locomotives. In addition there are now eighteen private oil companies operating in the two largest oilfields, and the rapid expansion of operation is creating a big field for many lines of mechanical equipment.

Argentina can no longer be considered as a purely agricultural country. Nearly a quarter of its 9,000,000 inhabitants live in the two cities of Buenos Aires and Rosario, and the ratio of industrial workers to farmers is increasing rapidly. It offers a splendid growing market for the sale of American machine shop equipment and industrial supplies, and the constructive efforts of American manufacturers to aid in the industrial development of Argentina will undoubtedly do much towards bettering the relations between the two countries.

Great Britain Fourth in Pig Iron Production

On the basis of ten months already recorded, Great Britain's output of pig iron in 1922 stands fourth, as compared with other iron producing countries, and its production of steel ingots third, says Assistant Trade Commissioner H. B. A. Smith, in a report to the Department of Commerce. Again, as in 1921, the United States, France, and Germany have exceeded Great Britain in output of pig iron; and the United States and Germany have outdone Great Britain in steel ingots. Average monthly production of pig iron in these countries in 1922 has been: United States, 2,092,220 tons; Germany, 510,000 tons; France, 393,660 tons; Great Britain, 387,190 tons. Monthly steel ingot averages are: United States, 2,702,100 tons; Germany, 725,000 tons; Great Britain, 467,700 tons; France, 351,000 tons. Belgium and Luxemburg fall well below Great Britain in both.

South Africa One of Our Best Belting Markets

British South Africa is one of our largest markets for rubber belting according to a report to the Department of Commerce from Trade Commissioner P. J. Stevenson. The value of exports under this heading being $477,936 in 1920, $214,893 in 1921, and $184,412 in the first ten months of 1922, when the weight of shipments was 426,780 pounds. The United States and Great Britain supply practically all the imports of "belting, other than leather" into the Union of South Africa. In 1919 the share of the United States was 45 per cent, in 1920, 52 per cent, and in 1921, 55 per cent, showing that our decreased exports in 1921 were due to smaller market requirements instead of greater competition.

Electrification of Railways in France Proceeding

The Minister of Public Works has inaugurated the operation of electrical equipment on the railway from Pau to Tarbes. The actual electrification has been installed only from Pau to Lourdes. This section is operated from the station Coarraze-Nay.

The Minister of Public Works states, says Commercial Attaché C. L. Jones, in a report to the Department of Commerce, that the southern railroad was committed to electrification of 3,000 kilometers of track at an early date, and that the Orleans and Paris-Lyons-Mediterranean Lines had each undertaken a similar promise. The director of the Midi Railroad states that the Line Pau-Tardes will be completely electrified by January 1, 1923; that the system will be extended to Montrejeau by March; and that during the summer of 1923 the Dax-Toulouse Line will be electrified.

World Popularity of American Machinery

American machinery and the men who make it hold high rank in every part of the world says the National City Bank of New York. We have sold to the outside world over $4,000,000,000 worth of machinery in the last decade against $1,000,000,000 in the decade immediately preceding, and $350,000,000 in the ten years ending with 1901, and the machinery is going in increasing quantities to every country and colony of the world.

The list of articles forming this group of "machinery" includes quite properly such important articles as locomotives, automobiles, and the engines by which they are operated, electrical machinery, agricultural machinery, sewing machines, typewriters, cash registers, adding and calculating machines, metal working machinery, mining machinery, textile machinery, printing presses, and the thousand and one evidences of American genius which have made our machinery the admiration of the mechanical and industrial world in every part of the globe, and brought into the United States over $5,000,000,000 from every part of the world in the last quarter of a century in payment for this class of output of our shops and factories. They represent the highest type of mechanical genius in the United States which leads the world in this particular, and their value both for practical service and as an evidence of high grade workmanship in American factories is recognized in every part of the world.

Specific Cases of Popularity

An evidence of the wide popularity of this product of the American factory is illustrated in the fact that the locomotives exported from the United States in even the lean trade year 1921 went to 35 different countries of the world and in the year 1920 to 45 countries; cash registers, a very recent factor in the exports of machinery, went in 1921 to 60 countries and colonies representing every grand division of the globe, while adding machines, a still more recent factor in the export line, went to approximately 50 countries in the same year. Elevators and elevator machinery, long popular in the United States, but more recently a requirement of the every day life in other parts of the globe went to 28 countries in 1921; gasoline engines, another comparatively recent type of machinery to 75 countries; traction engines, a still newer factor in the daily life of the world, to over 50 countries; laundry machinery to a score of countries and colonies; metal working machinery, of which the high value came to be especially recognized during the war, went to approximately 40 countries; oil well machinery, in which the United States quite naturally excels, to 30 countries; air compressing machinery to a score of countries; cream separators to over 30; sewing machines and typewriters to over 50 countries, while agricultural machinery, long a standby in the world around went literally to every part of the globe as did also the more recent requirement for transportation purposes, the passenger and now the commercial automobile which last year invaded over 75 countries and colonies scattered the world over.

The growth in world popularity of the American machine and the quality of the man who produces it is largely the result of the closer acquaintance which the world made with it during the war, as is evidenced by the fact that the total value of machinery exported in the last decade is more than four times as much as in the ten years preceding and twelve times as much as in the decade ending with 1901.

Strong Opposition Against Tax-Exempt Securities Amendment

Such opposition was developed in the House of Representatives against the proposed constitutional amendment aimed at tax-exempt securities that the consideration of the bill has been put over until late in January. Many are of the opinion that no further effort will be made to call it up. Even if it is brought t a vote later in the session, it is very doubtful if the proponents of the measure can muster the necessary two-thirds majority required to adopt a constitutional amendment.

The principal arguments advanced for the amendment are that tax-free securities shift taxation from the rich to the poor; that they divert capital from productive enterprise; create unrest because of the avenue afforded certain citizens to escape taxation, and that they encourage extravagance in municipal expenditures.

It was contended by the proponents of the amendment that no less than $1,000,000,000 of tax-free securities were issued in 1921 and that they will be issued in increasing amounts from this time forward. It was contended that as much as $18,000,000,000 of these securities now are outstanding. It was contended that the principal opposition comes from those who object to a slight increase in the rates on municipal bond issues. Doubt was expressed that this would result, due to the fact that savings banks and trust funds generally must be invested in that type of paper. Those who favor the amendment, however, admit that there are two sides to the question and that each side is strongly supported.

Opponents of the measure contended that the national government should not have the power of imposing taxes upon the bond issues of the cities, towns and counties. To do so, they believe, simply would transfer the burden to the people who issue the bonds and who in the course of time must redeem them. It was contented that it would paralyze the farm loan system and the great program of internal development, including highways, reclamation projects and the building of schools. Much of the influence behind the amendment, it was stated on the floor of the House, comes from those who already own large blocks of tax-exempt bonds, since the ratification of the amendment would increase enormously the market value of the tax-exempt securities already issued.

If tax-exempt securities are not forbidden, those who favor that action contend that the only alternative is to reduce greatly the surtaxes on incomes. Treasury figures were submitted to show that a man with a large income will receive more from a five and three-quarters tax-exempt security than he will from an investment paying 24 per cent. The president of American Electric Railway Association was quoted, in the course of the debate, to the effect that no one with an income of more than $10,000 can afford to buy an eight per cent taxable security, since he will net more from a five per cent tax-exempt bond. One of the arguments used most effectively for the amendment, however, was that showing that one man with an income of $25,000 from tax-free securities pays no taxes, whereas a man doing constructive service from which he has an income of $25,000 is heavily taxed.

On the other hand it was argued that the holders of tax-free securities are paying taxes nevertheless. They paid it at the source, without the cost and expense of collection when they made their contract for that low rate of interest. The consuming public pays the taxes, it was said. The man who takes the low interest-bearing security and allows a local community to have the benefit of that low interest rate pays an equivalent to a tax. Then, too, it was brought out that every county and every city is limited in the amount of bonds that they may issue. When a community of energetic people is willing to vote to put a mortgage on their homes in order to make public improvements, they should be allowed to do so, declared the opponents.

Business Items

The Byron-Jackson Iron Works, Inc., of San Francisco announces a change in the name of the firm to the Byron Jackson Pump Manufacturing Co., Inc. The change is effective January 1, 1923.

The Curtis Machine Co., Worcester, Mass., has been formed and taken over the business and plant of the estate of Albert B. Curtis. The new concern will improve and continue to manufacture the line of Curtis oil separators. George M. Duvall is general manager.

The Kilbourne & Jacobs Co., of Columbia, Ohio, manufacturer of mine cars, wheelbarrows and similar lines, has been reorganized by the election of Paul T. Norton, formerly with the Case Crane and Engineering Co., of Columbus, as president to succeed J. Russel Kilbourne. Mr. Norton took charge immediately and is making a survey of the plant. Mr. Norton will also be general manager. The board of directors is about the same as last year.

The Wayne Tank and Pump Co. of Fort Wayne, Ind., celebrated its thirtieth birthday recently by moving the executive offices into a handsome new office building. The new administration building is separated from the main plant buildings and is modern in every respect. It is of fire-proof construction, of handsome tapestry brick, and is one of the most distinctive industrial buildings in Indiana.

The Rhode Island Tool Co., Providence, R. I., manufacturer of tools, has increased its capital stock from $400,000 to $450,000.

The Kelly Springfield Motor Truck Co., Springfield, Ohio, has been placed in the hands of a receiver upon application of the Bankers Trust Co., New York. The petition for receivership carried with it the foreclosure of a mortgage for $1,500,000.

Riley & Foster, manufacturers' agents, whose headquarters are in Baltimore, Md. and Richmond, Va., have

been appointed Southern representatives for the Dolman Manufacturing Co., Inc., Springfield, Mass., manufacturers of the Dolman screw driver.

The Superior Piston Co. of Elmira, Ont., and the Lachine Piston Co. of Lachine, Quebec, have been merged and the business will be carried on at Elmira.

The Gibb Instrument Co., of Bay City, Mich., has taken over, under exclusive license, the manufacture and sale of the automatic and semi-automatic electric arc welding machines developed, and heretofore manufactured by the Fred Pabst Co., of Milwaukee, under their various letters patent, and has contracted to act as selling agent for the Pabst line of patented covered electrodes. The Fred Pabst Co. has spent over two years in the development of this line of equipment, and the field of application is said to be very wide, embracing the welding of tanks, range boilers, barrels and drums.

The Edwards Railway Motor Co., Sanford, N. C., has disposed of its $200,000 stock issue, according to officials of the company, and preparations are going forward to start manufacturing at the new plant early in the New Year. Orders for the cars have been received from railroad companies in sufficient quantity to keep the factory in operation for months.

The William J. Oliver Manufacturing Co. has completed its re-financing and the factory probably will resume operations at full capacity early in the New Year, according to an announcement made in mid-December by George L. Sexton, head of the Sexton-Oliver Co., of Knoxville, Tenn. It will employ about 1,000 men. This company is a large manufacturer of iron and steel products, and has been closed for some time.

Personals

BLAKE C. HOOPER, formerly with the Minnesota Supply Co., Pioneer Building, St. Paul, Minn., has been appointed special railroad agent by the Independent Pneumatic Tool Co., for the sale of Thor tools in the Northwest.

WILLIAM GILCHRIST, superintendent of the Imperial Oil Co., refineries at Sarnia, Ont., is retiring Dec. 31, after 39 years of continuous service. He will be succeeded by Charles B. Leaver who has been in charge of the company's plant at Montreal.

W. G. NEWTON has been appointed president of the Marf Machine and Die Casting Co. of Brooklyn, N. Y.

J. WARREN BATE, secretary-treasurer of the Canadian branch plant of the Andrews Wire Co., Watford, Ontario, is leaving shortly to take an executive position in the plant at Rockford, Illinois.

R. A. GRISWOLD, formerly with the Rivet Lathe and Grinder Co., has been appointed manager of the Detroit sales office of the Van Norman Machine Tool Co., Springfield, Mass.

F. RODGER IMHOFF, formerly sales manager and consulting engineer for the Precision & Thread Grinder Mfg. Co., has resigned his position with that company.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Machinery for manufacturing articles from henequen (sisal) fiber—Mexico. Machines for manufacturing specialties and for winding binder twine into balls are most needed. Catalogs are requested. Reference No. 4760.

Machine belting and lubricating oils—Sweden. Purchase desired. Quotations, c.i.f. Goteborg. Terms: Payment against documents. Reference No. 4762.

Lubricants, oils and greases, and cotton waste—Cuba. Purchase desired. Reference No 4763.

Leather belting, 1¼ to 4 inches in width—Italy. Purchase and agency desired. Quotations, c.i.f. Italian port. Terms: Cash against documents. Reference No. 4765.

Mineral-oil products and rosin—Czechoslovakia. Purchase desired. Quotations, c.i.f. German ports. Reference No. 4769.

Pipes, drawn or cast; fittings, wrought and cast; and iron sheets, black or galvanized; and oleine—Denmark. Agencies desired. Reference No. 4771.

Rails, switches, trolley wire, and machinery for electric-car line repair shop—Spain. Purchase desired. Quotations, c.i.f. Spanish port. Terms: Cash against delivery of purchases. Correspondence, Spanish or French. Reference No. 4821.

Machinery for making iron and brass beds and steel springs, machines for bending pipe, and shears for cutting angle irons—Mexico. Quotations, f.o.b. factory. Reference No. 4824.

Electric motors, alternating current, for operating sawing and planing machinery in a sawmill — Mexico. Purchase desired. Quotations, f.o.b. New York or New Orleans. Terms: Cash, or letter of credit. Reference No. 4826.

Machines for stamping and shaping sheet metal for enamel ware, also sheet steel suitable for making steel forms for enamel ware—China. Quotations, c.i.f. Swatow or Hongkong. Terms: Cash or letter of credit. Reference No. 4835.

Gas and water pipe: Black pipe, ¼ to 4 inches inside diameter, and galvanized pipe, ⅜ to 1½ inches inside diameter, with threads and couplings—Italy. Purchase desired. Quotations, c.i.f. Italian port. Terms: Cash against documents. Correspondence, Italian and French. Reference No. 4776.

Two or three machines for manufacturing double paper sacks, having square or rectangular bottom, with and without lateral folds, from two kinds of paper, in sheets (cannot use paper in rolls)—Switzerland. Purchase desired. Quotations, c.i.f. French port. Terms: Cash. Correspondence, French. Reference No. 4789.

Machinery for breweries, mineral-water factories, malting huoses, and various other purposes—Sweden. Purchase desired. Quotations, c.i.f. Goteborg. Terms: Payment against documents. Reference No. 4801.

Modern machinery for refining 24 tons of raw sugar each 24 hours, including centrifugals, filtering presses, and cube-making machinery; machinery for roasting and grinding 2½ tons of coffee each 24 hours, using existing transmission; and paper-bag making machinery for making bags holding 7½ kilos, 1 kilo, and one-fourth kilo, turning out 2,000 bags of each size every 24 hours—Brazil. Purchase desired. Quotations, c.i.f. Brazilian port. Terms: Cash against documents. Reference No. 4802.

Machinery for manufacturing printing and lithographing inks—Spain. Purchase desired. Quotations, c.i.f. Santander. Correspondence, Spanish. Reference No. 4808.

Machinery for pressing oil from coconuts—Panama. Purchase desired. Quotations, f.o.b. New York. Terms: Cash. Reference No. 4806.

Band-saw mill machinery—Canada. Purchase desired. Quotations, f.o.b. Canadian destination. Reference No. 4807.

Drilling machines (2) for use in connection with sulphur mines—Sicily. Purchase desired. Quotations, c.i.f. Sicilian port. Terms: Cash on arrival of goods. Reference No. 4809.

Trade Catalogs

Veeder Counters. The Veeder Manufacturing Co., Hartford, Conn. This company has just issued a new general catalog of 80 pages in which are described in detail and with numerous illustrations its complete line of cyclometers, odometers, counters, speed counters, tachmeters and fine die castings.

Grinding Machines. The Badger Tool Co., Beloit, Wis. This company has just issued in a loose leaf binder and attractive set of bulletins describing its various grinding equipment. The bulletins feature entirely the company's line of grinders of several types and the numerous excellent illustrations contained in them show the general and detailed constructive elements. There is also contained a complete list of the company's offices located throughout the United States and in various foreign countries.

Open Side Planers. The Cincinnati Planer Co., Cincinnati, Ohio. This company has just issued a new bulletin featuring the latest developments in its construction of open side planers. The bulletin fully describes the machines showing illustrations both as to general and detailed construction and gives the complete specifications covering each size.

Flat Turret Lathes. The Acme Machine Tool Co., Cincinnati, Ohio. A new bulletin featuring the No. 2 Universal Cincinnati Acme flat turret lathe has just been published by this company. The publication carries numerous illustrations and complete specifications on each size of machine with a detailed description of the construction details.

Forthcoming Meetings

American Engineering Council, Annual Meeting, January 11 and 12, at the headquarters of F. A. E. S., 24 Jackson Place, Washington, D. C. L. W. Wallace, Secretary.

National Automobile Chamber of Commerce, National Automobile Show, January 27 to February 3, 1923, Coliseum and First Regiment Armory, Chicago, Ill.

Society of Automotive Engineers, annual meeting, Jan. 9 to 12, 1923, Engineering Societies Building, 29 West 39th St., New York City. C. F. Scott is chairman.

American Institute of Electrical Engineers, Mid-Winter Meeting, February 14 to 16. Engineering Societies Bldg., New York. F. L. Hutchinson, Secretary.

American Society for Steel Treating, Winter Sectional Meeting, City Club, Chicago, Ill., Feb. 15 and 16, 1923. National Secretary, W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio.

Universal Patent Exposition, First Annual Convention and exhibit of patents and inventions, Grand Central Palace, New York City, February 17 to 22, 1923. A. B. Cole, 110 West 40th St., New York City, is chairman.

American Institute of Mining and Metallurgical Engineers, Annual Meeting, February 19 to 21. Engineering Societies' Bldg., New York. F. S. Shartless, Secretary.

Society of Industrial Engineers, Spring convention at Hotel Gibson, Cincinnati, Ohio, April 18 to 20. Secretary, George C. Dent, 327 South La Salle St., Chicago, Ill.

American Foundrymen's Association. Annual convention, and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago, is secretary.

American Electro Chemical Society, Semi-annual meeting, Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society for Testing Materials. Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

New and Enlarged Shops

Machine Tools Wanted

Fla., Fort Pierce—C. Wagenknecht—machine shop equipment, including lathes, drills, etc.

Ill., Alton—S. H. Held, 63 Bway, (carpenter)—lathe, 24 in. x 10 ft. bed (used).

Mass., Hyde Park (Boston P. O.)—B. F. Sturtevant Co., (manufacturer of blowers, fans, etc.)—gate shear equivalent to No. 3 Hilles & Jones, 50 in. between housings; No. 16 Blanchard high power vertical surface grinder (used).

Mass., Medford Hillside (Medford P. O.)—General Industries Co., Box 1, (machine shop)—power punch press (used).

Mich., Detroit—Cadillac Mchy. Co., Lafayette and Beaubien Sts.—one double end drilling machine to drive 4 in. drill in solid steel, length of work 56 in.; one No. 23 Brown & Sharpe gear cutter grinding machine.

Mich., Detroit—Detroit Pressed Steel Co., 6660 Mt. Elliott St.—1,600 ton power press.

Mo., Kansas City—R. A. Brink, 2818 East 31st St., (machine shop)—drill press, lathe and hand machinists' tools.

N. J., Newark—Katchen Show Iron Wks., 485 Lyons Ave.—drill press, punch, shear and one 5 ton overhead crane with monorail and trolley system.

N. Y., North Tonawanda—Spillman Eng. Co.—machine shop equipment.

N. C., Wilmington—Lingo City Machine Shop—machine shop equipment, to replace that which was destroyed by fire.

O., Columbus—Banner Die, Tool & Stamping Co., 525 North Park Ave., J. E. O'Brien, Mgr.—one 24 in. turret lathe; one press about 20 in.; one shearing machine; several breakers.

O., Columbus—Columbus Bed Spring Co., 456 Livingston Ave., H. Erkis, proprietor—one punch press.

O., Columbus—Palmer-Donavin Mfg. Co., 76 East 1st Ave., (manufacturer of tinware and metal products), G. B. Donavin, Genl. Mgr.—one stamping press.

O., Columbus—Reuppel Bros., 755 East Livingstone Ave., J. W. Reuppel, partner—lathe, press and other automobile repair equipment.

Pa., Darby — Roberts Filter Mfg. Co. (manufacturer of filters and machines)—pipe cutting machine up to 3 in., two 2 spindle drill presses, one portable air compressor and one air hammer (used preferred).

Pa., East Pittsburgh—Westinghouse Electric & Mfg. Co.—list of machine tools to be used at various service stations.

Pa., Fleetwood—Down Tool Wks., W. R. Down, owner—machinery and equipment for tool works.

Pa., Phila.—Penn Screw & Machine Wks., 712 Cherry St.—one No. 6 Brown & Sharpe automatic screw machine (used).

Pa., Phila. — Woodelium Mfg. Co., 131 Arch St., (wood products) — boring machines, drills, planers, etc., for new factory.

Pa., Phoenixville—E. A. Unger—automobile service and repair machinery, tools and equipment.

Tex., McKinney—Texas Cotton Co.—machine shop equipment.

Va., Richmond—Felton & Barnes, 1643 West Broad St., (automobile repair shop)—combination milling, boring and lathe machine.

Va., Richmond—Lloyd & Wiltshire, 1649 West Broad St., (automobile repair shop)—lathe and drill press.

Va., Richmond—Service Auto Repair Co., 806 West Broad St.—drill press and lathe.

Va., Richmond—Universal Service Co., 2043 West Broad St., (automobile repair works)—lathe (new or used) and drill press.

Wis., Milwaukee—O. F. Jeske, 937 Central Ave., (sheet metal works)—scroll cutting machine.

Wis., Mukwonago—Weinburg Bros.—repair machinery for proposed garage, also gasoline storage tank and pump.

Machinery Wanted

Ala., Bessemer—E. J. Jenkins—machinery for the manufacture of auto piston rings, etc.

Ala., Florence — Alabama Rock Asphalt Co., c/o C. W. Ashcroft—complete machinery and equipment for the development of a 700 acre tract of asphalt deposits at Margerum.

Ala., Mobile—Benner Lumber Co.—equipment for lumber mill, to replace that which was destroyed by fire.

Ark., Blytheville—Courier—pony printing press.

Ark., Eldorado—North Amer. Oil Co.—machinery and equipment for refinery, to replace that which was destroyed by fire.

Ark., Fort Smith—Ward Furniture Co., 200 North 1st St.—woodworking and hardwood polishing machinery.

Ark., Hot Springs—Beasely Lumber Co., Winona Ave.—machinery and equipment for mill work plant, to replace that which was destroyed by fire.

Calif., Fresno—Sunshine Bakery Co., 2020 Fresno St.—$20,000 worth of equipment for proposed baking plant.

Calif., Sunnyvale—Rogers Una Drive Motor Co., (manufacturer of motor trucks)—machinery and equipment for plant at Fresno.

Del., Wilmington—J. Bancroft & Sons Co., Rockford St., (manufacturer of woolens), J. H. Coady, Purch. Agt.—additional looms, etc., for new plant.

Fla., Mount Dora — Mount Dora Topic, W. E. McWhorter, Business Mgr.—newspaper equipment.

Fla., Tampa—Tampa Times, D. B. McKay, Editor—newspaper machinery and equipment for new plant.

Fla., West Palm Beach—J. A. Bogess—machinery and equipment for the manufacture of mop wringers, etc., for plant at Atlanta, Ga.

Idaho, Mountain Home—Mountain Home Republican—printing equipment.

Ill., Chicago—Chicago Wire Chair Co., 619 North La Salle St.—tinners' and sheet metal tools.

Ill., Rockford—F. Pagel, Rockton Ave.—machinery and tools for the manufacture of a patented metal drinking fountain for poultry.

Ind., Fort Wayne—Kunkle Valve Co., 825 Barr St.—machinery and equipment for addition to valve factory.

Ind., Gary—Tribune-Post—printing and newspaper machinery and equipment, to replace that which was destroyed by fire.

Ind., Hammond — W. B. Conkey, (job printer)—monotype.

Ind., Indianapolis — G. Dillon, 150 Virginia Ave.—machinery and equipment for the manufacture of wireless equipment.

Ind., Michigan City—Triangle Steel Products Co.—drop forge plant equipment.

Ia., Center Point—Independent—printing equipment.

Ky., Ashland — Bd. Educ. — vocational equipment for $100,000 school.

Ky., Louisville—United States Foil Co., 2934 Grand St.—machinery and equipment for $75,000 addition to tin foil manufacturing plant.

Mass., Boston—Hunt Spiller Mfg. Corp., 383 Dorchester Ave., (castings and iron works)—foundry and forging machinery, to enlarge plant.

Mass., Marlboro—Marlboro Wire Goods Co., High St.—machinery for proposed factory.

Mich., Detroit—Imperial Ink Compound Co., 138 West High St., (printing supplies)—equipment for small printshop, including paper cutter.

Mich., Detroit—F. Stearns & Co., 6533 East Jefferson St., (manufacturing pharmacists), C. M. McClure, Purch. Agt.—Kelley printing press.

Mich., Menominee—Amer. Rule & Block Co., 1614 Ogden Ave.—woodworking machinery, to replace that which was destroyed by fire.

Minn., Duluth — Patrick Duluth Woolen Mills, Inc., 600 Garfield Ave., Purch. Dept.—one Crompton & Knowles heavy type loom (used).

Minn., Oslo—R. E. Wilson — complete newspaper equipment (used preferred).

Miss., Belzoni—Barmer Printing Co.—printing equipment.

Miss., Brookhaven — Bd. Educ.—vocational equipment for $150,000 school.

Mo., Martinsville—L. R. Armentrout—complete newspaper equipment, including linotype, paper cutter, press, belting, hangers, pulleys and motor.

Mo., St. Louis—Andree & Son Wall Paper Co., 1918-20 Franklin St.—22 to 36 in. paper cutting machine.

Mo., St. Louis—Brown Shoe Co., 1700 Washington Ave., A. McArkle, Vice-Pres.—machinery for proposed shoe factory at Union City, Tenn.

Mo., St. Louis—Diamond Taxicab Co., 704 North Euclid Ave., H. Sonnenschein, Mgr.—500 gal. gasoline tank and pump for garage at 4460 Finney Ave.

Mo., St. Louis—E. Hilgert, 311 South 12th Blvd.—equipment for oil filling station on Kings Highway and Wabada Ave.

Mo., St. Louis — Mebourne Garage Co., 3508 Lindell Blvd.—550 gal. gasoline tank and other garage equipment.

Mo., St. Louis—Puritan Oil Corp., 28 West Ferry St., D. H. Cohen, Pres. and Treas.—500 gal. gasoline tank and pump for oil filling station, etc., at 100 West Ferry St.

Mo., St. Louis—Stout Sign Co., 2533 Sullivan Ave.—two power shears, 60 in. cylinder printing press and other equipment for proposed addition to embossed metal sign factory.

N. H., Nashua—Amer. Box & Lumber Co., 103 Main St.—machinery for lumber plant, to replace that which was destroyed by fire.

N. J., Irvington—R. Saunders, Supt.—equipment for vocational school.

N. J., Trenton—Mercer County Freeholders, Court House, E. E. Margerum, Dir.—crusher for county workhouse at Glen Moore.

N. M., Bernalillo—White Pine Lumber Co.—complete machinery and equipment for proposed lumber mill.

N. Y., Brooklyn—Rubel Coal & Ice Corp., Glenmore Ave. and Junius St.—ice making machinery for proposed plant on 18th Ave.

N. Y., Buffalo—Bd. Supervisors Erie County, City Hall, E. F. Jaeckle, Clk.—refrigeration machinery and equipment for plant at Alden.

N. Y., Buffalo—Chemical Charcoal Co., 246 Hertel Ave.—machinery and equipment for charcoal manufacturing plant, to replace that which was destroyed by fire.

N. Y., Buffalo—J. Costello, 107 Northland Ave.—automobile paint shop equipment.

N. Y., Buffalo—Flexlume Sign Co., 74 Kail St., R. Wiley, Pres.—machinery and equipment for 1 story sign manufacturing plant.

N. Y., Buffalo—E. E. Harris & Co., 22 Maurice St.—equipment, including two 1,000 gal. gas tanks and pumps for service station on Bailey Ave. and Seneca St.

N. Y., Buffalo—Huyler Candy Co., 350 Main St.—machinery and equipment for proposed large candy manufacturing plant on Delaware Ave.

N. Y., Buffalo—International Ry., Ellicott Sq.—car shop equipment, to replace that which was destroyed by fire.

N. Y., Elmira—Jayne Bros. Co., c/o W. S. Jayne, 1359 Lake Ave.—machinery and equipment for the manufacture of upholstered furniture.

N. Y., Jamestown—Acme Worsted Mills, Jones and Gifford Aves.—looms, spinning and drawing machinery for proposed addition to mill.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Tendency higher in finished steel products, following advances in coke and iron and steel scrap. Plates, shapes and bars firm at $2 per 100 lb., Pittsburgh, with few attempts at price shading. Heavy bookings of orders for ship and tank plates and car materials. Wire products up $1@$2 per ton at mill. Average advance of ¼c. per lb. on fabricated brass and copper products in New York and Cleveland warehouses. Copper market firm with heavy demand; prices tending upward. Old copper, lead and brass up ¼c.@½c. per lb. in Chicago. White and red lead, dry and in oil, ¼c. per lb. higher in New York. Linseed oil easier, generally; advance of 3c. per gal., however, reported in Chicago. Lard oil market steadier.

Declines—Tin quiet; prices tending downward. Chinese antimony down ¼c. per lb. in Chicago; cheaper in New York. Dealers purchasing prices of zinc scrap declined ¼c. per lb. in Chicago.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$27.55
Northern Basic	28.27
Southern Ohio No. 2	29.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	33.44
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	28.76
Virginia No. 2	33.17
Basic	27.50
Grey Forge	28.14
CHICAGO	
No. 2 Foundry local	28.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	28.51
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.00
Basic	24.25
Bessemer	27.50

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.0
Cleveland	5½@6
Cincinnati	4.5@6
New York	5.5
Chicago	4@5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.50	4.19	3.70	4.00
No. 12	2.60	4.24	3.75	4.05
No. 14	2.70	4.29	3.80	4.10
No. 16	2.90	4.39	3.90	4.20
Black				
Nos. 17 and 21.	3.20	4.30	4.20	4.70
Nos. 22 and 24.	3.25	4.35	4.25	4.70
Nos. 25 and 26.	3.30	4.40	4.30	4.75
No. 28	3.35	4.50	4.40	4.85

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	3.35	4.50	4.40	4.85
Nos. 12 and 14.	3.45	4.60	4.50	4.95
Nos. 17 and 21.	3.75	4.90	4.80	....
Nos. 22 and 24.	3.90	5.05	4.95	5.40
No. 26	4.05	5.20	5.10	5.55
No. 28	4.35	5.50	5.40	5.90

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	66	54½	⅜ to 1½	34	19
		LAP WELD			
2	59	47½	2	29	15
2½ to 6	63	51½	2½ to 4	32½	19
7 to 8	60	47½	4½ to 6	32½	19
9 to 12	59	46½	7 to 12	30	17
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	64	53½	⅜ to 1½	34	20
2 to 3	65	54½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	57	46½	2	30	17
2½ to 4	61	50½	2½ to 4	33	21
4½ to 6	60	49½	4½ to 6	32	20
7 to 8	56	43½	7 to 8	25	13
9 to 12	50	37½	9 to 12	20	8

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	57%	44%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded.	54%	41%	53½%	40½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 6%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.39	3.71	3.90
Cold rolled strip steel	6.75	8.25	7.25
Floor plates	5.50	5.16	5.50
Cold finished shafting or screw	3.90	3.75	3.70
Cold finished flats, squares	4.40	4.25	4.20
Structural shapes (base)	3.14	3.01	3.02½
Soft steel bars (base)	3.04	2.91	2.92½
Soft steel bar shapes (base)	3.04	2.91	2.92½
Soft steel bands (base)	3.84	3.61	3.55
Tank plates (base)	3.14	3.01	3.02½
Bar iron (2.60 at mill)	3.04	2.91	2.92½
Drill rod (from list)	55@60%	40%	50%
Electric welding wire:			
5/32	8.00		12@13
⅛	6.50		11@12
3/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.37½
Tin, 5-ton lots, New York			39.00
Lead (up to carlots), St. Louis	7.05;	New York,	7.62½
Zinc (up to carlots), St. Louis	7.05;	New York,	7.50

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	23.00	23.00
Antimony (Chinese), ton spot	7.25	8.37½	7.25
Copper sheets, base	23.50	22.50@22.75	23.00
Copper wire (carlots)	16.62½	18.75	16.25
Copper bars (ton lots)	20.50	22.75	19.50
Copper tubing (100-lb. lots)	25.25	25.75	23.00
Brass sheets (100-lb. lots)	19.00	21.25	18.75
Brass tubing (100-lb. lots)	23.50	24.25	20.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	17.00	19.50	15.75
Brass wire (carlots)	19.50	20.75	.....
Zinc sheets (casks)	10.25	10.25	.....
Solder (½ and ¼), (caselots)	27.50	24.75	20.00
Babbitt metal (83% tin)	42.00	48.50	36.00
Babbitt metal (35% tin)	25.00	17.50	.....
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	12.50	12.25
Copper, heavy, and wire	12.25	11.75	11 75
Copper, light, and bottoms	10.50	10.00	11.00
Lead, heavy	5.75	5.50	6.00
Lead, tea	5.25	4.50	4.75
Brass, heavy, yellow	7.00	.....	.....
Brass, heavy, red	9.50	9.50	9.50
Brass, light	6.00	5.50	6 50
No. 1 yellow brass turnings	7.00	6.50	7.50
Zinc	4 50	4.00	4.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.00	11.50	14.50
IC,	112 sheets	12.30	11.90	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.00	7.25
IC,	14x20	7.25	6.25	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.09@$0.11½	$0.12	$0.11¼
Cotton waste, mixed, per b.	.065@.10	.09	.08
Wiping cloths, 13¼x13¼, per lb.	.16	32.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	.20	48.00 per M	.13
Sal soda, 100 lb. lots	2.80	2.40	2.65
Roll sulphur, per 100 lb	2.90	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.93	1.01	.98
White lead, dry or in oil	100 lb. kegs.	New York, 13.50	
Red lead, dry	100 lb. kegs.	New York, 13.50	
Red lead, in oil	100 lb. kegs.	New York, 15.00	
Fire clay, per 100 lb. bag		.65	
Coke, prompt furnace, Connellsville	per net ton	$8.50@9.00	
Coke, prompt foundry, Connellsville	per net ton	8.50@9.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	40%	50-10-5%	50%
1½ and 1¼x3 in. up to 12 in	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30%	40–10%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ⅛ in., per 100 lb. (net)	$6.00	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	45%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1¼ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55–5%	50%	50%
Copper burs	35%	50%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.50	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin.ft., $2.88:			
Medium grade	30–10%	40½%	50%
Heavy grade	20–5–2½%	30–5%	40–5%
Rubber and duck:			
First grade	60%	50–10%	40-10%
Second grade	65%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1.40
Cloth	3.02	2 67	3.20

N. Y., Marion—Wayne Food Products Co.—machinery and equipment for food products plant, to replace that which was destroyed by fire.

N. Y., Oneida — Van Wheel Co., R. T. Weirton, Genl. Mgr.—machinery and equipment for 2 story wheel factory.

N. Y., Rochester—Northwestern Fdrys., 167 Villa St.—equipment for foundry, to replace that which was destroyed by fire.

N. C., Statesville—H. A. Yount—machinery for the manufacture of leather and fiber suitcases, handbags, etc.

O., Cleveland—Atlas Fdry. Co., Shaw Ave. along tracks of Cleveland, Cincinnati, Chicago & St. Louis Ry., J. H. Bruce, Pres.—3 ton crane for new foundry.

O., Columbus—Columbus Paint Mfg. Co., 272 Kimball Pl., (manufacturer of paints and oils), W. B. Peters, Mgr.—4 paint mills with motor.

O., Columbus—Hupp Products Co., 777 River St., (linoleum), P. Bush, Mgr.—rubber working equipment, including mills, refining machine and crackers.

O., Oakley (Cincinnati P. O.)—Williamson Heater Co., 335 West 5th St.—machinery and equipment for heater factory, to replace that which was destroyed by fire.

O., Sebring—O. H. Sebring—machinery for the manufacture of electrical supplies.

O., Shelby—Ohio Seamless Tube Co.—machinery and equipment for $200,000 addition to cold drawn steel plant.

O., Warren—Amer. Tank Car Corp.—one 15 ton crane.

O., Warren—Walnut Crest Lumber Co.—sawmill equipment, including edgers and trimmers equipment, for mill at Long Lake Sta. (Palestine P. O.), Tex., (used preferred).

O., Youngstown — Baldwin's Flour Mill, Oak Hill Ave., B. M. Baldwin, Mgr.—machinery and equipment, to replace that which was destroyed by fire.

O., Zanesville—Mark Mfg. Co., Putnam Ave.—equipment for conduit plant, to replace that which was destroyed by fire.

Okla., Okmulgee—Producers Gasoline Co., W. Pine, Pres.—machinery and equipment for the manufacture of gasoline.

Ore., Portland — Nicolai Door Co., Columbus Blvd., H. T. Nicolai, Pres.—planing mill and sash and door machinery.

Ore., Salem—The State Bd. of Control—woodworking machinery, broom machines and looms for proposed State Institute for the Blind on 82nd St., Portland, Ore.

Pa., Allentown—S. Mellner, 233 North 8th St.—machinery and equipment for proposed coal loading and handling station.

Pa., Allentown—Swift & Co.—machinery and equipment for proposed meat packing and cold storage plant.

Pa., Annville — Bd. Educ. — vocational equipment for $100,000 school.

Pa., Apollo—C. L. Pollock—7 cranes for new sheet steel mill.

Pa., Carnegie—Englert Bros. Co.—forge shop equipment.

Pa., Dublin—Dublin Feed Mill—machinery and equipment, to replace that which was destroyed by fire.

Pa., Erie—Jones Print Shop, 142 West 17th St.—printshop machinery and equipment, to replace that which was destroyed by fire.

Pa., Florence—Elk Run Mining Co.—additional coal mining machinery and equipment.

Pa., Lancaster—Bd. Educ.—vocational equipment for $400,000 school.

Pa., Lancaster — Keystone Oil & Gas Corp.—pump house equipment and machinery for proposed station at Williamsport.

Pa., Mill City — Falls-Overfield Twp. School District, R. H. Stark, Secy.—complete equipment for vocational school.

Pa., Phila.—Parkway Baking Co., 1226 Ridge Ave.—electric ovens, dough mixers, conveyors, etc., for new bakery.

Pa., Phila.—Pennsylvania R.R. Co., 17th and Filbert Sts., M. Smith, Purch. Agt.—a number of jib cranes and one 10 ton electric crane.

Pa., Phila. — Quaker City Japanning & Enameling Co., 10th and Buttonwood Sts.—vats, condensers, etc., for enameling works.

Pa., Pittsburgh—G. H. Soffel Co., 127 4th Ave., (plumbing)—Curtis air compressor.

Pa., Roaring Branch — Carpenter Shop, Box 22—one bandsaw with frame.

Pa., Turnpike—B. C. Gugler—machinery and equipment for plant for the manufacture of wire cloth and products.

Pa., Union City—Shrove Chair Co.—dust conveyor and sanding machinery.

S. D., Bowdle—W. Z. Todd—newspaper equipment, including press, paper cutter, belting, hangers, etc.

S. D., Claremont—A. G. Cox—complete job printing and newspaper equipment (used preferred).

Tenn., Trezevant—C. R. Williamson—machinery for the manufacture of farm implements.

Tex., Amarillo—Daily News—16 page tubular newspaper press, belting, hangers, pulleys, stereotype cutting machine, steam table and casting box.

Tex., Cooledge — J. J. Glover, (cabinet maker)—band saw, planer, rip saw and jointer for power woodworking equipment.

Tex., Dallas—J. Martin, 2814 Shelby St., (oil producer)—Star oil driller.

Tex., San Saba—N. L. Schnabel—power bakery equipment (used preferred).

Va., Richmond—Bair Bros., 904 West Broad St.—bench tools, vise and wrenches.

Va., Williamsburg—E. M. Hansom—complete machinery, including belting, etc., for soy bean and extracting plant.

W. Va., Grafton — United States Auto Twin Hooks & Chain Co., Inc., Box 465—non-skid automobile chain machinery and dies.

W. Va., Wayne—Bd. Educ.—vocational equipment for $100,000 school.

W. Va., Wellsburg—Hammond Bag & Paper Co., Box 467—cast iron beating machinery, hangers, belting, pulleys, shafting, rotary steamers and cookers.

Wis., Balsam Lake — C. W. Nystrom, (quarry)—rock crushing machinery.

Wis., Beloit — S. Maninoff, East Grand Ave., Dearborn Rd.—oil storage tanks and pumps.

Wis., Beloit — F. L. Penney, 2nd and Island Sts., (iron worker)—crane.

Wis., Cazenovia—R. Robertson—creamery machinery, including churns, separators, testers, scales, belting, shafting, hangers and pulleys.

Wis., Darien—Bd. Educ., H. J. Heyer, Clk.—manual training equipment for new addition to high school.

Wis., Green Bay—Green Bay Newspaper Co., 315 Cherry St.—presses, paper cutters, etc., for proposed printing plant.

Wis., Jefferson — Jefferson County Bd., c/o County Clk.—refrigerating machinery for county farm.

Wis., Jefferson—W. Voight—power refrigeration machinery, several ton capacity.

Wis., Milwaukee—F. C. Bogk, 1206 Ry. Exch. Bldg., (paints)—pigment crushing machinery.

Wis., Milwaukee—F. Fischer, 408 Austin St., (carpentry and woodwork)—woodworking machinery.

Wis., Milwaukee—J. L. Hahn, 2904 North Ave., (heating and plumbing)—power pipe cutting machine.

Wis., Milwaukee—Salvo Sales Co., 413 6th St.—machinery and equipment for the manufacture of specialties.

Wis., Sheboygan—E. A. Juul, Engr. and Archt., Imig Bldg.—blue printing machinery and equipment.

Wis., Sturgeon Bay—Door County Fruit Growers Union, E. L. Johnson, Mgr.—additional canning and power machinery.

Wis., Superior—Superior Creamery Co., 1113 Ogden Ave., J. W. Patterson, Purch. Agt.—additional power driven creamery equipment, including belting.

Ont., Alliston—J. Carr—equipment for planing mill.

Ont., Brantford—Glen Motors, Ltd., J. H. Minshall, interested—equipment for plant for the manufacture of air cooled motors.

Ont., Collingwood—Postal Lock Nut Bolt Co., F. A. Bassett, Mgr.—additional machinery and equipment for factory.

Que., Montreal—W. I. Bishop, Ltd., 10 Cathcart St., (contractors)—one traveling crane for dam contract in Chicoutimi District.

Que., Montreal — Dominion Tetxile Co., Victoria Sq.—machinery, etc., for plant at Sherbrooke.

Sask., Gull Lake—Revelstoke Saw Mill Co., Ltd.—additional equipment for sawmill.

Metal Working Shops

Calif., Pittsburg — The Columbia Steel Co., 10th and Johnson Sts., Portland, Ore., and the Utah Coal & Coke Co., Portland, Ore., plan to build a steel plant, here. Architect not announced.

Calif., San Francisco — A. S. Bugbee, Archt., 26 Montgomery St., is receiving bids for the construction of a 2 story, 130 x 150 ft. garage on Stevenson St. between Ecker and Jessie Sts. for the Stevenson Garage, Inc., c/o Archt. Cost will exceed $40,000. Noted Dec. 21.

Calif., San Francisco—L. R. Lurie, Mills Bldg., is having plans prepared for the construction of a 2 story, 120 x 192 ft. garage on Fell and Gough Sts. Estimated cost $100,000. O'Brien Bros., Inc., 240 Montgomery St., Archts. Pacific Telephone & Telegraph Co., 333 Grant Ave., lessee.

Calif., San Francisco—L. R. Lurie, Mills Bldg., awarded the contract for the construction of a 2 story, 62 x 137 ft. garage on Sacramento St. near Polk St. Noted Nov. 30.

Calif., San Francisco—The Star Garage, c/o T. McDougall, 150 Turk St., is receiving bids for the construction of a 2 story addition to its garage. Estimated cost $60,000. J. L. Stewart, Claus Spreckels Bldg., Archt. Noted Nov. 30.

Calif., Stockton—Sattui Bros. Motor Co., 215 North Sutter St., plans to build a 2 story garage on South Hunter and Market Sts. Estimated cost $40,000.

Conn., Bristol—H. H. Judd, West and Laurel Sts., will build a 1 story, 80 x 100 ft. garage. Estimated cost $40,000.

Conn., Waterbury—The Connecticut Castings Co., Watertown Ave., plans to build a 1 story castings shop. Architect not announced.

Ill., Chicago—Nelson Bros., c/o O. Van Gunten, Archt., 26 East Huron St., is receiving bids for the construction of a 3 story, 50 x 125 ft. automobile sales building and repair shop at 6310-14 Bway. Estimated cost $100,000.

Ill., Mount Vernon—The Mount Vernon Car Mfg. Co. is having plans prepared for the construction of 1 story, 150 x 500 ft. car shops. Estimated cost $50,000. Private plans.

Ind., East Chicago—The Bates Expanded Steel Truss Co., Forsythe St., is having plans prepared for the construction of a 1 story 80 x 120 ft. first unit of fabricating plant. Estimated cost $100,000. Private plans.

Ind. Indianapolis—The Capitol & St. Clair Realty Co. Indiana Trust Bldg. is receiving b'ds for the construction of a 1 story 112 x 122 ft. automobile service station on North Capitol Ave. Estimated cost $27,000. D. A. Bohlen & Son, Majestic Bldg., Archts. Noted Dec. 28.

Ind., Indianapolis — The Meridian & Thirteen St. Realty Co., c/o Kopf & Woolling, Archts., Pythian Bldg., awarded the contract for the construction of a 3 story, 100 x 200 ft. garage and service station on North Meridian St. Estimated cost $250,000.

Ind., Lebanon—Cline & Hicks will build a 1 story, 40 x 40 ft. and 60 x 100 ft. machine and service shop. Estimated cost $40,000. Noted Oct. 26.

Ind., Marion — The Marion Machine & Fdry. Co. is having plans prepared for the construction of a 2 story, 45 x 100 ft. addition to foundry and machine shop. Estimated cost $100,000. H. Elder, Archt.

Ind., Michigan City—The Triangle Steel Products Co. is having plans prepared for the construction of a 1 story, 30 x 60 ft. steel plant. Estimated cost $25,000. Private plans.

Ind., South Bend—The Studebaker Corp. plans to build a 4 story, 120 x 700 ft. addition to its factory. Estimated cost $450,000. Architect not selected.

Ia., Cedar Rapids—The Sieg Co., 5th and Iowa Sts., Davenport, is having plans prepared for the construction of a 2 story, 60 x 140 ft. pump manufacturing plant on 2nd Ave., between 6th and 7th Sts., here. Estimated cost $70,000. R. Vorkoper, Local Mgr. Architect not announced.

Me., Houlton—The Bangor & Aroostock R.R., Graham Bldg., Bangor, plans to rebuild its 1 story railroad shop, at freight yards, here, which was recently destroyed by fire. Estimated cost $60,000. Private plans.

Mass., Marlboro—The Marlboro Wire Goods Co., High St., is having plans prepared for the construction of a 1 story, 80 x 150 ft. factory. Estimated cost $50,000. J. F. Bigelow, 64 Highland Ave., Archt.

Minn., St. Paul—The Hamm Realty Co., 311 Hamm Bldg., awarded the contract for the construction of a 2 and 3 story, 150 x 150 ft. garage and tire supply station on 8th and Sibley Sts. Estimated cost $88,000. Noted Dec. 7.

Mo., St. Louis—The Stout Sign Co., 2533 Sullivan Ave., awarded the contract for the construction of a 1 story, 50 x 144 ft. addition to its embossed metal sign factory. Estimated cost $15,000.

N. H., Concord — The Boston & Maine R.R., North Sta., Boston, plans to build a 1 story car shop at its freight yard, here. Estimated cost $225,000. Private plans.

N. Y., Buffalo—The Amer. Radiator Co., 693 Main St., plans to build 2 small additions to its plant on Austin St. Estimated cost $9,500. Architect not announced.

N. Y., Buffalo—Eagles & Kiener, 3074 Main St., plan to build a 1 story, 60 x 100 ft. garage and service station. Estimated cost $40,000. Architect not announced.

N. Y., Buffalo—The Flexlume Sign Co., 74 Kail St., plans to build a factory for the manufacture of electrical advertising devices and signs on Skillen St. and Military Rd. Estimated cost $40,000. Architect not selected.

N. Y., Buffalo—The International Ry., Ellicott Sq., plans to rebuild its Cold Springs car barns and shops, which were recently destroyed by fire. Cost between $250,000 and $300,000. Architect not announced.

N. Y., Dunkirk—The Amer. Locomotive Co., 30 Church St., New York City, plans to build an addition to its locomotive works, here. Estimated cost $50,000. Architect not announced.

N. Y., Rochester—The Northwestern Fdrys., 167 Villa St., plans to rebuild the portion of its foundry, which was recently destroyed by fire. Estimated cost $15,000. Architect not announced.

N. Y., Rochester—The S. Snyder Corp., 10 Mart Pl., plans to build an addition to its machinery and supplies plant. Estimated cost $7,000. Architect not announced.

N. Y., Troy—The Fuller & Warren Co., foot of Monroe St., plans to rebuild a portion of its stove factory on River St., which was recently destroyed by fire. Estimated cost $55,000. Architect not announced.

O., Cleveland—The Atlas Fdry. Co., c/o J. H. Bruce, Pres., Shaw Ave., along tracks of Cleveland, Cincinnati, Chicago and St. Louis Ry., has had plans prepared for the construction of a 1 story, 100 x 140 ft. foundry on West 69th St., along tracks of Wheeling and Lake Erie Ry. Estimated cost $60,000. J. E. A. Moore, 1900 Euclid Ave., Archt.

O., Cleveland—The Standard Equipment Co., c/o O. J. Ashman, Mgr., West 106th St. and Lorain Ave., manufacturer of automobile supplies, has had plans prepared for the construction of 1 story additions to its factory. Estimated cost $75,000. Private plans.

O., Oakley (Cincinnati P. O.)—The Williamson Heater Co., 335 West 5th St., plans to rebuild the portion of its heater factory, which was destroyed by fire. Estimated cost $100,000. Architect not announced.

O., Zanesville—The Mark Mfg. Co., Putnam Ave., plans to rebuild the portion of its conduit plant, which was destroyed by fire. Estimated cost $100,000. Architect not announced.

Ore., Portland—The Columbia Steel Co., 10th and Johnson Sts., and the Utah Coal & Coke Co. plan to build a steel plant. A. M. Clark, Mgr. Architect not announced.

Ore., Portland — The Southern Pacific R.R., Yeon Bldg., will build additions to its Brooklyn shops, consisting of a 40 x 60 ft. car wheel repair shop and a 44 x 625 ft. shelter and repair shed. Estimated cost $35,000.

Pa., Berwyn — The Suburban Ice Co. awarded the contract for the construction of a 2 story, 60 x 110 ft. garage and repair shop. Estimated cost $50,000.

Pa., Phila. — P. H. Tyre, Archt., 1509 Arch St., is receiving bids for the construction of a 4 story, 122 x 220 ft. garage and service building on 30th and Market Sts. for the Guy A. Wileys Motor Co., Broad and Vine Sts. Estimated cost $150,000.

R. I., East Providence—The United Electric Rys. Co., Providence, awarded the contract for the construction of a 1 and 2 story, 170 x 535 ft. car house and repair shop on North Bway., here. Estimated cost $400,000. Noted Dec. 21.

Wash., Spokane—R. M. Sanderson, Engr., will receive bids in the spring for the construction of a 1 story, 60 x 120 ft. sheet metal mill on East Sprague St. for T. A. Farrington. Estimated cost $15,000.

Wis., Beloit — The Beloit Iron Wks. awarded the contract for the construction of a 1 story, 50 x 80 ft. machine shop. Estimated cost $40,000. F. L. Penney, Mgr.

Wis., Milwaukee—C. W. Valencourt, 172 12th St., is having plans prepared for the construction of a 1 story, 64 x 100 ft. garage on 16th St. and Fond du Lac Ave. Estimated cost $45,000. R. E. Oherst, 317 Grand Ave., Archt.

Wis., Mukwonago — Weinburg Bros. are having plans prepared for the construction of a 2 story, 40 x 60 ft. garage. Estimated cost $40,000. C. F. Ringer & Son, 432 Bway., Milwaukee, Archts.

Wis., Wisconsin Rapids — The Prentiss-Wabers Manufacturing Co. is having plans prepared for the construction of a 2 story, 65 x 110 ft. factory for the manufacture of automobile camp stoves. T. A. Taylor, Mgr. M. C. Jacobson, Archt. Noted Dec. 7.

General Manufacturing

Ala., Mobile—The Benner Lumber Co. plans to rebuild the portion of its lumber mill, which was destroyed by fire. Estimated cost $150,000.

Ark., Eldorado—The North Amer. Oil Co. plans to rebuild its refinery, which was destroyed by fire. Estimated cost $200,000. Architect not announced.

Ark., Hot Springs—The Beasely Lumber Co., Winona Ave., plans to rebuild its millwork plant, which was destroyed by fire. Estimated cost $40,000.

Calif., Fresno—The Sunshine Bakery Co., 2020 Fresno St., plans to build a 2 story baking plant on Van Ness and California Sts. Estimated cost including equipment $80,000.

Calif., Modesto—J. S. West, 709 9th St., plans to build an ice plant. Estimated cost $30,000.

Calif., Richmond — The Healy-Tibbits Constr. Co., 64 Pine St., San Francisco, is having preliminary plans prepared for the construction of a rock crushing plant, here. Estimated cost $250,000. Private plans.

Calif., Sacramento—The Consumers Ice & Cold Storage Co., 8th and D Sts., will build an addition to its plant on Hickman Tract near Freeport Rd. Estimated cost $41,000.

Calif., San Francisco—J. S. Malloch, 180 Jessie St., will build a 1 story, 30 x 63 ft. candy factory on 8th St. near Heron St. Estimated cost $5,000. Albert Sheetz Mission Candy Co., 6661 Hollywood Blvd., Los Angeles, lessee.

Conn., Bridgeport — Fletcher-Thompson, Inc., Engrs. and Archts., 542 Fairfield Ave., receiving bids for the construction of a 3 story corset factory, 170 ft. long, on Federal St. for A. V. Langenegger, 2190 Park Ave. Estimated cost $150,000. Noted Dec. 14.

Conn., Bridgeport—The New Haven Dairy Co., 201 Hazel St., New Haven, plans to build a 3 story ice cream and dairy plant on Railroad St. and South Ave., here. Estimated cost $150,000. Architect not announced.

Conn., Norwalk—The Griffing Mfg. Co., 61 Wall St., plans to build a knit goods factory. Estimated cost $50,000. Architect not announced.

Ill., Chicago—The A-1 Cleaners & Dyers Co., 5312 Bway, awarded the contract for the construction of a 1 story, 50 x 70 ft. addition to its dyeing and cleaning plant. Estimated cost $30,000.

Ill., Chicago—Ludgins & Leviton, Archts., 53 West Jackson Blvd., are receiving bids for the construction of a 2 story, 25 x 115 ft. addition to factory at 2234 North Campbell Ave., for J. A. Dukow, c/o Archt., manufacturer of gloves. Estimated cost $20,000.

Ind., English—The Rice Box & Basket Co. plans to build a 3 story factory. Estimated cost $125,000. Architect not selected.

Ind., Evansville—The Evansville Packing Co., Morgan Ave., is receiving bids for the construction of a 3 story, 31 x 42 ft. refrigeration plant. Estimated cost $45,000. H. E. Boyle & Co., Furniture Bldg., Archts. Noted Dec. 28.

Ind., Evansville — B. W. Jenkins, 522 Outer 4th Ave., is receiving bids for the construction of a 1 story, 40 x 100 ft. packing plant. Estimated cost $26,000. H. E. Boyle & Co., Furniture Bldg., Archts. Noted Dec. 28.

Ind., Indianapolis—The Polar Ice & Fuel Co., 2000 North Western Ave., awarded the contract for the construction of a 1 story, 47 x 83 ft. addition to its ice plant on South East St. Estimated cost $27,000.

Ind., Indianapolis—The Republic Cresoting Co., Merchants Bank Bldg., awarded the contract for the construction of a 1 story, 85 x 102 ft. condenser and still building. Estimated cost $25,000.

Ind., Lawrenceburg—The Johnston & Klare Mfg. Co. is having plans prepared for the construction of a 3 story, 80 x 300 ft. furniture factory. Estimated cost $58,000. Private plans.

Ind., Madison—The Pearl Packing Co. will build a 1 story, 56 x 129 ft. packing plant. Estimated cost $26,000.

Ind., Seymour—J. J. Briggs, 206 Pythian Bldg., Indianapolis, is having plans prepared for the construction of a 1 story, 48 x 96 ft. stucco factory, here. Estimated cost $25,000. Private plans.

Ind., South Bend—W. O. Davies, 211 West Jefferson Blvd., is having plans prepared for the construction of a 2 story, 45 x 72 ft. laundry on Sycamore St. Estimated cost $25,000. Private plans.

Ia., Clarinda—Swift & Co., 76 West Monroe St., Chicago, is having plans prepared for the construction of a 2 story, 76 x 144 ft. cold storage plant, here. Estimated cost $125,000. H. Gilmore, Mgr. A. S. Van Sandt, Clarinda, Engr.

Ky., Paducah—The Paducah Ice Co., is having plans prepared for the construction of a 2 story, 75 x 220 ft. ice manufacturing plant on South 3rd St. Estimated cost $70,000. Pillsbry-Becker Eng. Co., 119 South 11th St., St. Louis, Mo., Archts. Noted Dec. 7.

La., New Orleans—The Fulton Bag & Cotton Mills, South Front St., between Gaiennie and Erato Sts., awarded the contract for the construction of 62 x 97 ft. and 45 x 85 ft. buildings. Estimated cost $25,000.

Mass., Fitchburg—The Star Worsted Co. awarded the contract for the construction of a 5 story, 67 x 125 ft. addition to its worsted goods plant. Estimated cost $125,000. Noted Nov. 30.

Mass., New Bedford—The Acushnet Mills Corp., Delano St., awarded the contract for the construction of a 1 story, 60 x 100 ft. addition to its picker house on South Front St. Estimated cost $40,000.

Mich., Jackson—The Michigan State Prison is having preliminary plans prepared for the construction of a state prison, including textile plant, etc., on North Farm. Estimated cost $5,000,000. Smith, Hinchman & Grylls, 800 Marquette Bldg., Detroit, Archts.

Mich., Menominee—The Amer. Rule & Block Co., 1614 Ogden Ave., plans to rebuild its 2 story factory, which was recently destroyed by fire. Architect not selected.

N. H., Nashua—The Amer. Box & Lumber Co., 103 Main St., plans to rebuild its lumber plant on Edgevelte St., which was recently destroyed by fire. Cost between $175,000 and $200,000. Architect not announced.

N. J., Trenton—The City Comn. will build a workshop for the Trenton School of Industrial Art. Estimated cost $50,000.

N. J., Wildwood — The O. H. Ice Co. awarded the contract for the construction of a 1 story, 80 x 120 ft. ice plant. Estimated cost $25,000.

N. M., Bernalillo—The White Pine Lumber Co. plans to build a lumber mill. Estimated cost $500,000. Architect not announced.

N. Y., Brooklyn—The Rubel Coal & Ice Corp., Glenmore Ave. and Junius St., will build a 2 story, 120 x 151 ft. ice plant on 18th Ave. near Cropsey Ave. Estimated cost $500,000.

N. Y., Buffalo—The Chemical Charcoal Co., 246 Hertel Ave., plans to rebuild the portion of its charcoal manufacturing plant which was destroyed by fire. Estimated cost $8,000. Architect not announced.

N. Y., Jamestown—The Acme Worsted Mills, Jones and Gifford Aves., plans to build a 2 story, 70 x 100 ft. addition to its mill. Estimated cost $100,000. Architect not announced.

N. Y., Long Island City—The Latham Lithographing & Printing Co., 33 West 42nd St., New York City, awarded the contract for the construction of a 150 x 250 ft. printing plant on Woodside and Barnett Aves., here. Estimated cost $450,000.

N. Y., Marion—The Wayne Food Products Co. plans to rebuild its food products plant, which was destroyed by fire. Estimated cost $70,000. Architect not announced.

N. Y., Tonawanda—The Amer. Kardex Co., Main St., is receiving bids for the construction of a 2 story, 50 x 160 ft. addition to its kardex filing plant. Estimated cost $70,000. L. Eggert, 35 Elmwood Ave., Archt.

O., Cleveland—E. Huberty, Archt., 8017 Whitethorn Ave., is receiving new bids for the construction of a 2, 3 and 4 story, 73 x 140 ft. addition to bakery at 2701 Barber Ave. for the J. Spang Baking Co., 2711 Barber Ave. Estimated cost $125,000. J. Spang, Pres.

O., Marion—The Fairfield Eng. Co., Lancaster, is building a 90 x 240 ft. plant for the manufacture of gas and oil well equipment along tracks of Erie and Cleveland, Cincinnati, Chicago and St. Louis R.R., here, to replace one which was destroyed by fire.

O., Sandusky—The Ajax Rubber Co., 220 West 57th St., New York City, is having plans prepared for the construction of a 6 story plant for the manufacture of tires, here. Estimated cost $1,000,000. S. M. Green Co., 293 Bridge St., Springfield, Mass., Engrs.

O., Youngstown—Baldwin's Flour Mill, Oak Hill Ave., plans to rebuild its plant, which was destroyed by fire. Estimated cost $50,000. B. M. Baldwin, Mgr. Architect not announced.

Ore., Astoria—The Hammond Lumber Co. plans to rebuild its saw and planing mill, and sash, door and box factory, which was recently destroyed by fire. Estimated cost $700,000. Private plans.

Ore., Kenton (Portland P. O.)—The Nicolai Door Co., Columbus Blvd., Portland, will build a 70 x 200 ft. dry kiln, here. Estimated cost $30,000. H. T. Nicolai, Pres.

Ore., Oak Ridge—The Davis & Webber Lumber Co. will enlarge mill.

Ore., Portland—The Nicolai Door Co., Columbus Blvd., will build a 2 story, 50 x 100 ft. addition to its plant on Front and Couch Sts. Estimated cost $30,000. H. T. Nicholai, Pres.

Ore., Portland—The Portland Gas & Coke Co., Gasco Bldg., plans to expend $600,000 for extending mains and new gas holders, $300,000 for extending and renewing gas plant and $100,000 on buildings and miscellaneous improvements. H. Pabst, Genl. Mgr.

Pa., Allentown—The Lehigh Valley Poster Co. awarded the contract for the construction of a 1 story, 60 x 125 ft. poster advertising plant on Jerome St.

Pa., Allentown—S. Mellner, 233 North 8th St., plans to build a coal loading and handling station on Lehigh St. Estimated cost $20,000. Architect not announced.

Pa., Allentown—Swift & Co. plan to build a meat packing and cold storage plant on Lehigh St. Estimated cost $5,000. Architect not announced.

Pa., Bethlehem — The Kurtz Bros. Co. awarded the contract for the construction of a 1 story furniture factory, consisting of 8 buildings. Estimated cost $750,000. Noted Nov. 30.

Pa., Chester—The Stauffer Chemical Co., Front St., awarded the contract for the construction of a 1 and 2 story chemical factory. Estimated cost $157,000.

Pa., Dublin—The Dublin Feed Mill plans to rebuild its mill, which was destroyed by fire. Estimated cost $20,000. Architect not announced.

Pa., Phila.—The Breyer Ice Cream Co., 8th and Cumberland Sts., awarded the contract for the construction of a 2 story ice cream factory on 43rd and Woodland Sts. Estimated cost $45,000.

Pa., Phila. — The Schlorer Delicatessen Co., Water and Mifflin Sts., awarded the contract for the construction of a delicatessen factory. Estimated cost $200,000.

Pa., Phila.—Stanton & Stewart, Archts., 1524 Chestnut St., are receiving bids for the construction of a 2 story, 87 x 97 ft. bakery for the Parkway Baking Co., 1226 Ridge Ave. Estimated cost $30,000.

Pa., Scranton—Clark & Snover, 7th Ave. and Doackash Pl., manufacturers of tobacco, plan to remodel their plant. Estimated cost $33,000. Architect not announced.

Pa., Williamsport—The Keystone Oil & Gas Corp., Lancaster, plans to build a bulk station for oil and gasoline, including 20,000 gal. and 10,375 gal. tanks, etc., here. Estimated cost $20,000. Architect not announced.

R. I., Pawtucket—The Darlington Textile Co., Hughes Ave., awarded the contract for the construction of a 1 story, 90 x 140 ft. addition to its mill. Estimated cost $30,000.

S. C., Great Falls—The Republic Cotton Mills will receive bids until Jan. 15 for the construction of a 1 story, 400 x 4,000 ft. cotton mill. Estimated cost $500,000. J. E. Sirrine, South Main St., Greenville, Archt.

Tenn., Union City—The Brown Shoe Co., 1700 Washington Ave., St. Louis, awarded the contract for the construction of a 3 story, 45 x 250 ft. and 60 x 80 ft. shoe factory, here. Estimated cost $200,000. A. McArkle, Vice Pres.

Tex., Dallas—The Ginner & Miller Publishing Co., 1802 Jackson St., is receiving bids for the construction of a 2 story book bindery on Commerce and Murray Sts. Estimated cost $60,000. Architect not announced.

Tex., Dallas — The Texas-Oklahoma Phonograph Co., 908 Commerce St., has had preliminary plans prepared for the construction of a 3 story factory and warehouse on McKinney Ave. Estimated cost $50,000. A. C. Dennis, Mgr. Architect not announced.

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BUSINESS NEWS DEPARTMENT
Tenth Ave. at 36th St., New York

Tex., Greenville—The Greenville Mill & Elevator Co., c/o G. M. Richter, plans to build additions to its plant. Estimated cost $100,000. Architect not selected.

Tex., Port Arthur—Bd. Educ. is having plans prepared for the construction of a 2 story, 80 x 232 ft. grade school, including manual training shops, etc., on De Queen Blvd. Estimated cost $150,000. W. B. Ittner, 911 Locust St., St. Louis, Mo., Archt.

Tex., Port Arthur—Bd. Educ. is having preliminary plans prepared for the construction of a 2 story, 145 x 160 ft. addition to Manual Training High School, including metal, woodworking and machine shops, print shop, etc. Estimated cost $200,000. W. B. Ittner, 911 Locust St., Archt.

Va., Altavista—The Altavista Cotton Mill Co. awarded the contract for the construction of 3 additions to its plant. Estimated cost $100,000.

W. Va., Buckhannon—The Belgrade Glass Co. plans to build a 1 story, 95 x 315 ft. glass plant. Architect not selected.

W. Va., Kenova—Morgan Bros. plan to build a hardwood lumber mill. Estimated cost $60,000. Architect not announced.

W. Va., Williamson—The Williamson Ice & Storage Co. awarded the contract for the construction of a 5 story, 40 x 60 ft. ice plant. Estimated cost $60,000.

Wis., Cudahy—The Milwaukee Vinegar Co., 79 Buffalo St., Milwaukee, is having plans prepared for the construction of a 3 story, 100 x 110 ft. yeast house, here. E. R. Liebert, 432 Bway., Milwaukee, Archt.

Wis., Green Bay—The Green Bay Newspaper Co., 315 Cherry St., is having plans prepared for the construction of a 2 story, 60 x 150 ft. printing plant. Estimated cost $100,000. Foeller, Schober & Stephenson, Nicolet Bldg., Archts.

Wis., Madison—The Valvoline Oil Co., 815 East Main St., awarded the contract for the construction of two 40 x 50 ft. filling stations and warehouse on Lakeside St. Estimated cost $40,000. Noted Dec. 14.

Wis., Marshfield—L. Kohl, 110 West 4th St., plans to build a 1 story, 30 x 60 ft. automobile painting works. Estimated cost $10,000. Private plans.

Wis., Merrill — The Merrill Handle Co. awarded the contract for the construction of a 1 story, 100 x 108 ft. factory and warehouse. Estimated cost $40,000. J. H. Heib, Pres.

Wis., Milwaukee—The Birkholz Eng. Co., 290 3rd St., is receiving bids and will open same about Jan. 2, for the construction of a 2 and 3 story, 63 x 68 ft. factory on Wilcox St., for the Ricketson Mineral Paint Wks., South Bay St. Estimated cost $22,000.

Wis., Nekoosa—The Nekoosa Creamery Com., c/o W. A. Radke, Chn., plans to build a 2 story creamery and dairy. Estimated cost $40,000. Architect not selected.

Wis., Rhinelander—S. Miller Cold Storage Co., c/o S. Miller, Pres., Marshfield, plans to build a 3 story, 44 x 120 ft. cold storage plant, here. Estimated cost $150,000. Architect not selected.

Wis., Rosholt—M. S. Colrud will rebuild the 1 story, 50 x 85 ft. feed and grinding mill, which was destroyed by fire. Estimated cost $25,000.

Wis., Sheboygan—The Badger State Tanning Co., South Water and Maryland Sts., plans to build a 4 story, 50 x 95 ft. addition to tannery, including warehouse. Estimated cost $50,000. F. Zschetzche, Mgr. Architect not selected.

Wis., Sheboygan — The Northern Furniture Co., South Water and New Jersey Sts., is having plans prepared for the construction of a 2 story, 185 x 200 ft. factory. Estimated cost $75,000. W. C. Weeks, Archt.

Wis., Stetsonville — The Ripon Produce Co., c/o A. E. Wells, Secy., Ripon, plans to build a 1 story, 50 x 95 ft. dairy, here. Estimated cost $40,000. Architect not selected.

Wis., Stevens Point — The Consolidated Water Power & Paper Co., c/o G. W. Mead, Secy., Wisconsin Rapids, is having plans prepared for the construction of a 2 story paper mill, etc., here. Estimated cost $300,000. L. A. De Guere, Wisconsin Rapids, Engr.

Wis., Verona—The Dane County Bd., Court House, Madison, Plans to build a 4 story, 100 x 140 ft. insane asylum building, including cold storage plant, here. Estimated cost $150,000. M. Sommers, Chn. Architect not selected.

Wis., Watertown—The Perfection Table Slide Mfg. Co., 603 Clyman St., plans to build a 2 story, 75 x 150 ft. factory for the manufacture of table slides. Architect not selected. W. C. Schulz, Mgr.

Wis., Waunakee — The Waunakee Canning Co., c/o A. P. Kenney, Waunakee State Bank, plans to build a 2 story, 60 x 95 ft. canning factory. Estimated cost $100,000. Architect not selected.

Wis., West Allis—The Gas Tank Recharging Co., 1245 23rd Ave., Milwaukee, is receiving bids for the construction of a 1 story manufacturing plant, consisting of a 41 x 81 ft. carbide storage building, a 20 x 29 ft. boiler house, a 41 x 81 ft. purifying, etc., building a 41 x 81 ft. shipping and storage building and a 41 x 100 ft. recharging building, here. O. C. Randolph, 53 West Jackson Blvd., Chicago, Ill., Engr.

Ont., Brampton—The McIlroy Belting & Hose Co., Hammond, Ind., plans to build a factory for the manufacture of hose and belting, here. Estimated cost $25,000.

Ont., Ottawa—The McAuliffe-Davis Lumber Co., 57 Duke St., plans to build a lumber mill. Estimated cost $40,000. Architect not announced.

Ont., Toronto—The Kellogg Toasted Corn Flakes Co., 40 Strachan Ave., has purchased site and plans to build a breakfast food factory on Victoria Park Ave. Estimated cost $150,000. Architect not selected.

Que., Riviere a Pierre—Jobbin & Genois, Abraham Hill, Quebec, plan to build a marble manufacturing plant, here. Estimated cost $25,000. Architect not announced.

Que., Terrebonne—Limoge & Co. plan to build a 40 x 80 ft. sash and door factory. Estimated cost $45,000. Private plans.